THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

AND

SANITARY IMPROVEMENT.

58066

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

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GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
Proprietors: STEVENS & CO.,
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Works: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO.
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Page 6.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:

RANELAGH WORKS, ROYAL AVENUE CHELSEA, LONDON, S.W.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

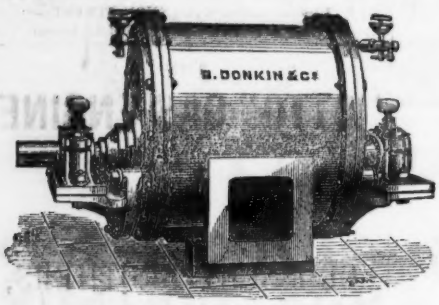
GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

HONOURABLE MENTION, **J. E. WILLIAMS & CO.,** PARIS EXHIBITION, 1878.

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.



J. BEALE'S
NEW PATENT GAS-EXHAUSTERS,

For the Manufacture of which

MESSRS. B. DONKIN & Co.

POSSESS THE SOLE RIGHT.

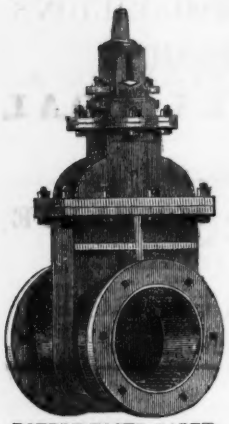
Made with two Outside Bearings and with all the Latest Improvements.

FULL PARTICULARS ON APPLICATION.

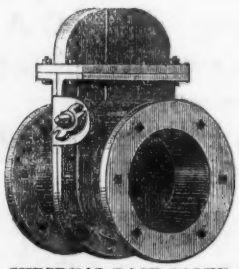
BERMONDSEY, LONDON, S.E.

Messrs. B. D. & Co. are also Manufacturers of Steam-Engines and of Improved Gas and Water Valves, &c., &c.

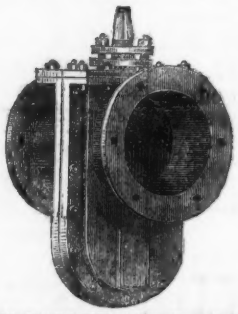
C. & W. WALKERS' GAS-VALVES.



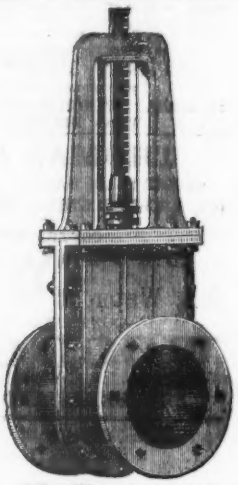
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

Original Manufacturers of Dry Meters in Cast-Iron Cases.

STATION-METERS, EXPERIMENTAL-METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

GRANGE WORKS, EDINBURGH.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GAS PURIFICATION
BY
OXIDE OF IRON.
GAS PURIFICATION & CHEMICAL Co., LIMITED,
PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

G. J. EVESON

Has on Sale a large quantity of Cannel, South Yorkshire, Wigan, and Ruabon Coal, purchased previous to the late advances.

Prices on Application.

GAS COAL AND CANNEL CONTRACTOR, BIRMINGHAM.

HYDRATED PURIFYING MATERIAL.
Samples on application.

MESSRS. SPENCE BROS., LIMITED,
Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

ROBT. DEMPSTER & SONS,
GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;
CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.
MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,
ROTHERHAM:
AND 85, SOUTHWARK ST., LONDON, S.E.

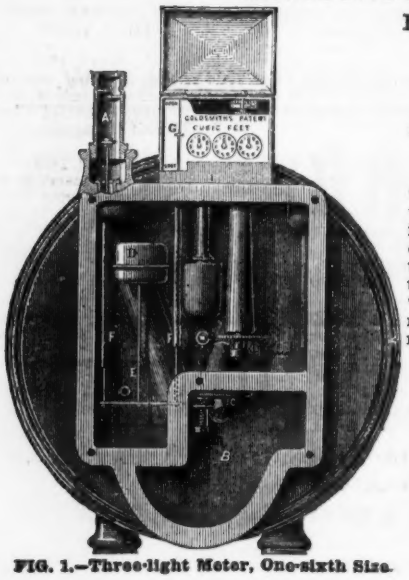


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

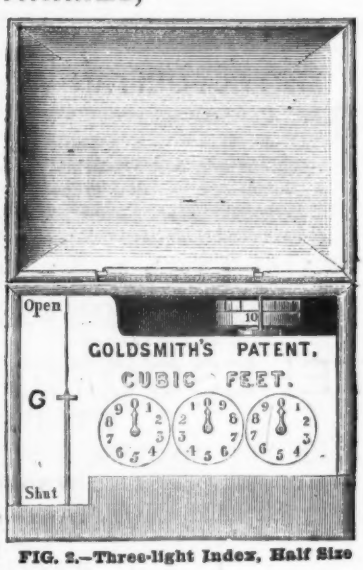


FIG. 2.—Three-light Index, Half Size

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED of ANY REQUIRED STRENGTH.

The cost of the Machine defrayed by the Ammonia obtained in Twelve Months.
It requires very little attention, and cannot get out of order.

These Machines have been supplied to the following Gas-Works:—

The Gaslight Company, London—	
Beckton	5,000,000 feet per day.
Bromley	7,000,000 " "
St. Pancras	3,000,000 " "
Bradford Corporation	1,000,000 " "
Bremen	150,000 " "
Buxton Local Board	250,000 " "
Dukinfield Local Board	500,000 " "
Driffield Company	100,000 " "
Goole Company	250,000 " "
Glossop Company	300,000 " "
Holywood Company	125,000 " "
Heywood Local Board	600,000 " "
Leeds Corporation	2,000,000 " "
Leominster Company	150,000 " "
Maidstone Company	1,000,000 " "
Phœnix Gas Company, London—	
Greenwich	2,500,000 " "
Vauxhall	3,000,000 " "
Yeadon Company	500,000 " "

And many others are in course of construction.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Engine-Works, Millbank, Westminster, S.W., March 5, 1879.*

Gentlemen,—In accordance with your instructions I have taken diagrams from Vertical Engine driving your Patent Horizontal Washer-Scrubber to purify 60,000 feet of gas per hour on the works of The Gaslight Company at King's Cross, and find the following results, viz.:—

Horse power required to drive engine, shafting, and gearing alone . . . . . = 0·898
Total horse power with washer on . . . . . = 1·721
Absolute horse power required to drive Washer-Scrubber. . . . . = 1·323

(Signed) THOS. HORN.

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Bromley-by-Bow, E., June 2, 1879.*

Gentlemen,—I have much pleasure in stating that the results of the working of Kirkham, Hulett, and Chandler's Washer-Scrubber, erected at these works in 1877, have been perfectly satisfactory, and that the two erected last year are doing well—all that you guaranteed; indeed, the effectiveness of the machine is so convincing, that I am induced to recommend another being ordered if you can undertake to have it erected complete before next winter. (Signed) W. B. WRIGHT, Engineer.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug. 12, 1879.*

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing though it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia on the inlet (fixed and free) obtained from a large number of tests was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works.

(Signed) P. J. WATES, Engineer.

FOR RESULTS AND OTHER TESTIMONIALS, SEE NEXT WEEK'S JOURNAL.

For Prices and further particulars, address

KIRKHAM, HULETT, AND CHANDLER, LIMITED, 59 & 60, Palace Chambers, Bridge Street, Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.

Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES: Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS, MANCHESTER.

LONDON HOUSE: 116, Queen Victoria St., E.C.

THE NEW GAS COOKER.

40 PER CENT. OF GAS SAVED.

No. A510 same as our **No. A152,**

BUT LINED WITH PATENT NON-CONDUCTOR.

Will Roast, Bake, and Fry, and with Three Burners for Boiling.

SIZE.

Outside—30in. high, 20in. wide, 20in. deep.
Inside—19½in. „ 14in. „ 17in. „

Price . . . . . **£4 14s. 6d.**

No. A500.

LINED WITH PATENT NON-CONDUCTOR.

Is fitted with Roasting and Baking Oven and Four Burners for Boiling.

SIZE.

Outside—34in high, 20in. wide, 19in. deep.
Inside—30in. „ 16in. „ 17in. „
Hot Plate—24in. by 23in.

Price . . . . . **£7 10s. 0d.**

No. A505.

Same as with Roasting and Baking Oven, a Broiler or Toaster, a Chop Griller, a Hot Water Boiler, and Three Burners for Boiling.
Hot Plate—26in. by 24in.

Price . . . . . **£9 15s. 0d.**

These Cookers are jacketed, on the sides, top, and door, with a new and very efficient non-conducting material, by the use of which a **saving** of gas to the extent of **40 per cent.** is effected.

Gas Companies who are selling or hiring stoves should see these stoves. Catalogues and particulars on application to

JOHN WRIGHT & CO., ESSEX WORKS, BROAD STREET, BIRMINGHAM.

London Warehouses: { 155a, Upper Thames Street, / 1, Little Bush Lane.

TANGYE BROTHERS AND HOLMAN,

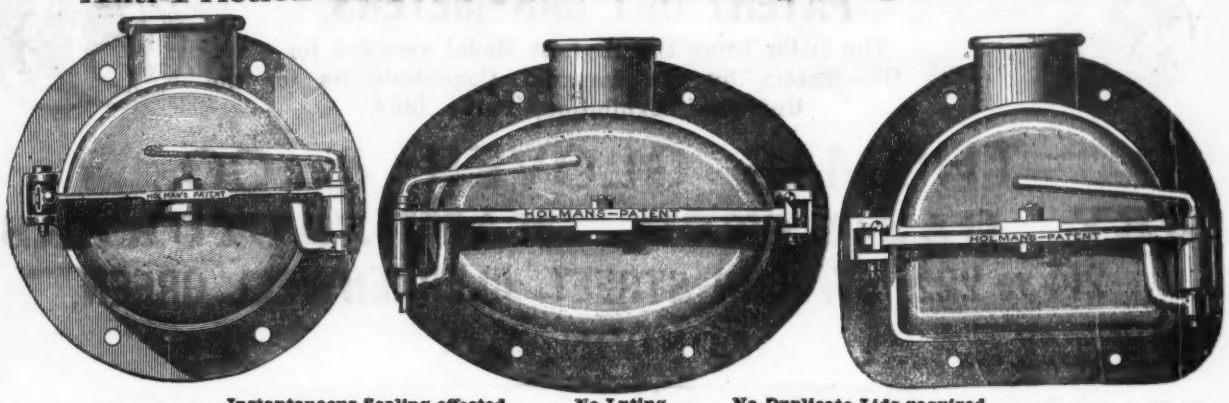
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland)

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

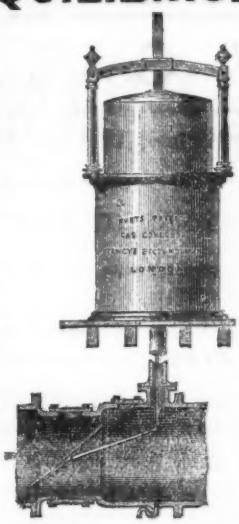
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

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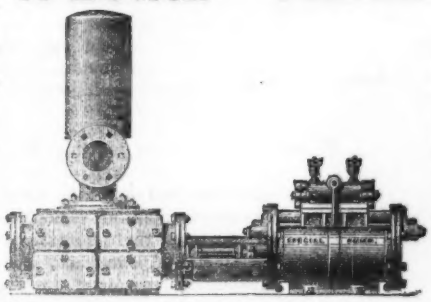
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



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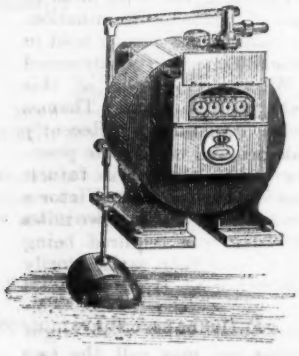

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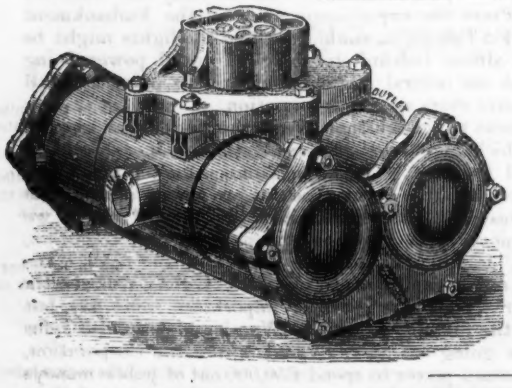

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TO CORRESPONDENTS.

G. SIMMONDS (Reigate), *and* R. P. THOMAS (Ware) *are thanked for their letters on the subject of Frozen Lamp Services.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 6, 1880.

Circular to Gas Companies.

THE advent of a new year naturally causes one to cast a retrospective glance over the events of that which has just passed away. Time is, of course, continuous, but it is convenient that divisions should be made, and among these the most important is that which marks the close of what it is customary to call one year and the commencement of another. Looking back over the occurrences of the past twelve months, we find that, as respects Metropolitan Gas Companies, the most important has been the inauguration of a system of amalgamation among the Companies south of the Thames. At the beginning of the year it was rumoured that overtures had been made which, had they resulted in success, would have brought some of the Southern Companies into union with the great combination on the north; but the negotiations—if anything that could be called negotiation took place—fell through, leaving the Southern Companies exactly as they were. But the idea of amalgamation could not be allowed to drop, and it was soon found that the South Metropolitan Company were negotiating in earnest for a union with the Surrey Consumers Company. The case presented some difficulties, but a scheme sanctioning the combination was eventually approved by the Board of Trade, and subsequently confirmed by the Privy Council. It took effect from the 1st of July last, but the combined working did not, we believe, commence till October. We have said that the case presented some difficulties, which it required all the sagacity of Mr. George Livesey, the Secretary and Engineer of the South Metropolitan Company, to surmount. Two Companies had united, one of which was charging 3s. per thousand feet for their gas, while the other charged 3s. 9d. It was clear, then, that Companies with such differential rates to consumers could hardly hang together, so the bold proceeding was taken of reducing the price in the late Surrey Company's district to 3s. We may stop here for a moment to pay a meed of praise to the magnanimity of the Directors of the South Metropolitan Company, who, we dare say not without due calculation, have conferred this great benefit upon the gas consumers in the district of the late Surrey Company.

Although this was the only amalgamation consummated during the past year, progress was made with another which we regard as of a more important character. We refer to the projected union of the Phœnix Company with the South Metropolitan, a scheme to effect which is now before the Board of Trade, and in the modified form in which it was last presented will, we have no doubt, in a few days receive the sanction of the Board. The capital arrangements, which have already been described, we expect have now been settled to the satisfaction of every one; but in this case again the question of price to be charged for gas will crop up. At the present time the Phœnix Company charge 3s. 4d. per thousand feet, and at this rate make little more than their statutory dividends. When becoming a part of the South Metropolitan Company, the price will eventually be reduced to a level, and 3s. will be charged over the whole district. This drop will necessarily make a considerable difference in the profits of the amalgamated Company. But perhaps we are here rather prospecting than reviewing past results. We may safely leave the combined undertakings to the management of those into whose hands they will fall, satisfied that due care will be taken alike of shareholders and consumers.

Last year we commenced our retrospect with a notice of the electric light, which in the year then past had just come into somewhat limited use in this country. In the course of the past year the employment of the light for public illumination has considerably increased, and to a certain extent for the lighting up of shops; but, so far, nothing has been done to prove that it can be made a means of domestic illumination. The one invention which seems to have taken a strong hold in the Metropolis is that of M. Jablochkoff, which is patronized by the Metropolitan Board of Works. By means of this system we have now a considerable portion of the Thames Embankment and Waterloo Bridge illuminated. Recently an important experiment was made, which bears on the possibility of the use of electricity for public lighting in future. A wire starting from Charing Cross was carried to the Victoria Station of the Metropolitan District Railway, about two miles distant—a much greater length than was required being interposed. The station was said to have been satisfactorily lighted, but the experiment has not been continued. Of course, the one thing necessary to know, when we are considering street lighting, is the number of lights that might have been interposed between what we may call the two termini. From the experiments made on the Embankment and Waterloo Bridge, it would seem that the lights might be multiplied almost indefinitely, sufficient initial power being supplied at one central station; but on this point we shall presently have more specific information.

It is curious to remark that of all the systems of electric lighting which have been introduced, that of M. Jablochkoff has proved the best. The Rapieff finds a limited use in *The Times* office, but the Lontin no longer shines outside the Gaiety Theatre. The Werdermann system, of which we expected most, seems to have dropped out of recognition, leaving M. Jablochkoff complete master of the field. The inventions of the genius of Menlo Park, U.S.A., still remain upon paper. They may prove of importance some day, but at present the promise is small. We should here also refer to what is going on at Liverpool, where the Corporation, having obtained power to spend £50,000 out of public moneys—and, we imagine, whatever sum they please out of their own private property—have gone in for experiments to demonstrate, if possible, the utility of the light for public and interior illumination. Bound down, as they are, not to make any profit by the supply of the light to such establish-

ments as railway stations, hotels, theatres, music halls, &c., the experiments, we imagine, are being carried on in a manner which is not, perhaps, likely to ensure success. Still, the passing of the Liverpool Lighting Act last year marks an era in the history of public illumination, and we wait with some curiosity for the results which will be obtained. Last year there was a rage among Gas Companies to obtain power for supplying the electric light; but inasmuch as little was known about the economic conditions under which it could be provided, a Select Committee of the House of Commons was appointed to report on the matter. Their decision was that the time was not yet ripe for legislation on the question, and thereupon all applications of Gas Companies fell through. We do not expect that any similar attempts on the part of the Companies will be made in the coming session.

During the past year Metropolitan gas shares have undergone some rather, for them, violent fluctuations in value, and it would be idle to ascribe this to anything but the influence of fear of the ultimate predominance of the electric light. No doubt in these scares a few shares change hands, but we take it that, as a rule, they fall into the holding of astute persons, who, after waiting a short time, put them quietly into the market again, and realize what we call normal prices. For example, a few weeks ago, Metropolitan gas shares were somewhat depreciated in value, but they have now gone back to their usual price.

One good result of the use of the electric light in our public thoroughfares has been to stimulate invention in the improvement of burners and lanterns for public use, and great success has been obtained in this direction. A number of Sugg's admirable lamps were set up in Waterloo Place and in the Waterloo Road, and gave universal satisfaction, so long as the gas consumed was furnished gratis by the Gas Companies. But increased illumination can only be obtained by an increased consumption of gas, and when the Vestries found that they would have to pay more for improved light, the experiments were countermanded. Mr. Wigham's lights at the western end of the Embankment excited general admiration; but these, too, have gone the way of all attempts to improve street illumination by means of gas. Expectation is on tiptoe as to the future use of the electric light, and no Local Authority will now, if they can avoid it, add to their gas bills.

Improved methods of lighting railway carriages have been devised by Messrs. Pintsch and Co., whose inventions have been noticed in our columns; while another invention has more recently come before us, in which coal gas, to which has been added a small amount of petroleum oil, is compressed into cylinders that are carried along the roofs of the carriages, and from this convenient situation supply gas to the lanterns beneath. The invention, so far, has proved eminently successful, and the future contest for lighting railway carriages will, we anticipate, be between these two systems.

To speak the truth, there is little to be said about new inventions. Their number, we may almost say, is legion; but until any or some are established in general use, it is impossible for us to notice them. All our Gas Managers Associations held highly successful meetings in the course of the year, and many ingenious ideas were thrown out, and some processes described which, when thoroughly worked out, will no doubt tend greatly to the improvement of our manufacturing art. It is, however, so difficult to appraise the value of inventions without having had some practical experience of their working, that we always hesitate to express an opinion, the more so as we notice that gas managers almost invariably contradict each other when new processes and apparatus are under discussion. We welcome, however, the rapid increase in the number of members of these Associations, which must in the long run tend to the advancement of our industry. At the present moment the subject which seems to create the greatest interest is the mode of heating retort-settings, and regenerative furnaces are in the ascendant. That of Dr. Siemens has been used with much success on a limited scale in this country. Those of MM. Oechelhäuser and Liegel have had a larger application with success on the Continent. In America, also, they have been applied to the satisfaction of all who have used them. We look forward to a day when these furnaces will receive a large application in this country, to the advantage of gas-makers and all concerned in undertakings.

Nothing further occurred than was noticed above of the dealings of Parliament with Gas Companies during last year. Entirely new Companies who applied for parliamentary powers, of course, escaped auction clauses and sliding scale; but, in general, established Companies who went for incorporation were made subject to both. In like manner statutory Companies who applied for further powers had to submit to recent legislation. One object of the Legislature seems to have been to secure, as far as possible, reductions in the price of gas. The initial prices under the sliding scale have always been made low—too low, in our opinion, considering the possible future of the undertakings concerned. But Gas Companies, even those not under the sliding scale, have of their own mere motion reduced prices, and it may be said that at the present time the gas-consuming interest is of paramount consideration. How far it may be possible to make further reductions in the future remains to be seen. We have before referred to the revival of trade and the general rise of prices. Everything connected with the manufacture of gas shares in the general elevation of price, and we are looking forward to see, at no distant date, something like a revival of the condition of things which obtained in 1873–4. The sliding scale now bars any applications for a revision of price, such as were made in former times, and the Companies must take the goods the gods send them, and be thankful for whatever dividend they may receive.

While, therefore, heartily congratulating Gas Companies on their success during the past year, we cannot help calling attention to rocks ahead. At present there would appear to be but slight danger in these, and we have little doubt that the able steersmen who guide the Companies affairs will safely take them through the dangers with which they may be beset. We may conclude this short retrospect by wishing all our readers a prosperous New Year.

Every step in the direction of economizing the cost of purification is a gain to Gas Companies. Over oxide we have now full control. With proper treatment it may be made to last for ever, whilst everything it takes out of the gas is a marketable product. So much cannot be said for lime, which, when spent, has up to recent times been considered purely a waste material. A small use has been made of it in agriculture, and some is used in the works. Still, the money obtained for spent lime bears no proportion to the original cost of the stone. Thus every process which pretends to revivify the spent material must be of great interest to gas-makers, especially to those who are situated in districts where lime has to be fetched from a distance. Several processes for this revivification have been published in our columns, and to-day we give another. The compression of the spent lime into bricks before it is placed in the revivifying furnace is a very good idea; and the heating arrangements, as described by a correspondent, appear to be excellent. But one thing seems to us to be deficient. Spent lime, as it comes from the purifiers, is, we rather think, according to Graham's analysis, mainly a mixture of carbonate, sulphite, and sulphate of lime, the two latter forming about twenty per cent. of the spent material. Now, these compounds cannot be changed back into caustic lime by means of the process described by our correspondent. The carbonate of lime, which constitutes about fifty per cent., will, of course, be reduced to caustic lime, and be available for purification; but the sulphur compounds must necessarily increase with every repetition of the revivifying process. Hence we should have thought that three or four, instead of forty re-burnings, would have reduced the substance to a material too inert for purification.

The Corporation of Dublin and the Gas Company are still at variance as to the terms on which the public lights shall be supplied. The Company very properly adhere to the terms which they have offered, and which were reported in our columns a fortnight ago. It seems to escape the notice of the Company's opponents that every case must be judged on its own merits. The conditions of gas supply in Belfast and Dublin cannot be compared. In the one case there is a corporate undertaking, well situated for the production and sale of gas; in the case of Dublin, we have an instance of a company undertaking less favourably situated for the manufacture of gas, and moreover with a comparatively limited sale for private consumption. Notwithstanding this, however, the price of gas in Dublin has been reduced as far as it can be, leaving the Shareholders of the Company their statutory rights, while making provision for depreciation, renewals, &c., which must be provided for out of profits. No one would think of saying that the Company do not *make* more than ten per cent.; but should this case of public lighting go to arbitration—which it possibly may, but we do not think will—we feel satisfied that the Directors of the Company will have no difficulty in demonstrating that they are only availing themselves of the powers which the Legislature has very properly given them. It is pleasant to see that with a multitude of enemies in the Council, the Gas Company have some energetic defenders. The High Sheriff, in a vigorous speech at a recent meeting, showed that, taking all things into consi-

deration, the gas consumers of Dublin are as well served as those in most large cities in the kingdom. The gas distributed is of high quality, and if the price has not been reduced, more than an equivalent has been given by raising the quality. We need hardly repeat that gas of what is called sixteen-candle power, tested by a flat-flame burner, is furnished, such gas being equal to eighteen candles at least if tested by the burner used in Belfast. Now, as one candle is considered equal in money value to threepence, it follows that there is little or no difference in the price of gas in Dublin and Belfast.

Water and Sanitary Notes.

THE history of water affairs during the past year presents few points of importance. The Metropolitan Companies, we may say, have kept on the even tenor of their way, in every case improving their works, and, as it might be, extending them to meet the increased requirements. They have gone farther, and done what will always redound to their credit—namely, extended a system of constant supply and a service of hydrants, in neither of which enterprises were they at all assisted by the Local Authorities, except, indeed, in so far as hydrants were concerned. The Corporation of the City of London early took up the matter of hydrants, and at their own expense distributed them all over the City. Some of the Water Companies, at all events, seem at last to have been aroused to the situation in which circumstances, which they might have controlled, have placed them. The Southwark and Vauxhall Company, for example, have given notice of a Bill which would have empowered them to amalgamate with the other Metropolitan Companies; but, as will be seen below, it is now all too late. What was possible, and what might have been effected, if our advice had been taken two years ago, is at the present moment unattainable. The Metropolitan Water Companies, as commercial undertakings, may be said to have passed away. Their future is vague and indefinite, and all we can hope is that the Shareholders will not suffer from any change of proprietorship.

It would appear that the water undertakings of the Metropolis are fairly lost to the Companies. Mr. Cross, to carry out the promise he made to Parliament last session, has appointed Messrs. Smiths and Gore, of Whitehall Place, to conduct the various negotiations necessary for the purchase by the Government of the London Water Companies. Two, it is reported, have already acceded to the terms which have been offered, and it is expected that the rest will fall in quick succession. We take this statement, which we believe to be substantially correct, for what it is worth, and then wish to inquire what the Government, having purchased the water undertakings, intend to do with them. Surely they do not mean to retain and manage them, carrying to the Consolidated Fund whatever profits they may yield. The question of the London Water Supply is not a national one; it is a purely local matter. The Metropolitan water undertakings, if they do not belong to the Companies, are, it may be said, the property of the ratepayers, and should be managed for their general benefit. But possibly we are not doing Mr. Cross justice. It may be his intention, when he has acquired the undertakings, to hand them over to a Water Trust, who shall manage them for the good of the Metropolis at large. If so, well; but, in any case, do not let the London water consumer be misled. He will not get water cheaper or better. In the course of years, fresh sources of supply may be introduced; but for the present, and for a long time to come, he will have to be content with the much-abused Thames and Lea supplies. For half a century or more he will only be able to receive a mixture of the deep-well and river supplies, except in certain districts, in which the deep-well water may be accessible. These changes, however, will necessitate a great outlay. By what means is this to be met? There is but one answer to the question. The necessary extensions will be made with borrowed money, the interest on which will have to be paid by the Metropolitan ratepayer. No doubt money for the purpose will be lent at about four per cent., which is a different thing to paying Shareholders in Water Companies an average of seven and a half per cent. Still, it must be remembered that the water-works have to be paid for, and this leads us to consider at what rate the payment must be made. Mr. Cross's notion, that the shares should be bought up at the value they possessed last July, all, we think, will agree to be inadmissible. Nearly every Metropolitan Company has increased in worth since that date. Messrs. Smiths and Gore have, no doubt, found this out, and, we hope, have made due recognition of the fact, which we may be certain has been forced upon their attention by the Companies. Speaking generally and in round numbers, we may say that the shares in the Water Companies last July were worth nearly double their nominal value. If it be intended to pay off the Companies in lump sums, the above would be about the price to which the Shareholders will be entitled; but if payment be made by way of annuities, we suspect that these will be estimated according to a three years average of the dividends. In some cases, and one in particular, this would be manifestly unfair. The Southwark and Vauxhall Company were for some years under a cloud, and have only just recovered what we may call their normal position so far as regards finances. It would therefore be altogether unjust to buy them up at an average of the years preceding 1878. At their last division they paid six per cent. per annum, and there would be every prospect of their continuing the same dividend for years to come. As for the New River Company, their value it is impossible to assess. We leave this difficult nut for Messrs. Smiths and Gore to crack. Before the week is out we shall probably have further information as to the alleged purchases, of which at present we possess only rumours. This much we may say, however, that if the Water Companies feel themselves aggrieved by the action of the Government, they have only themselves to thank for it. For years we have pressed upon their attention the policy of amalgamation, which, if it had been carried out, would have saved them from the Government clutches. The *cui bono* of the transfer of the undertakings we shall have to discuss at some future time.

The working man is the pet of the day. For him large portions of the Metropolis are converted for a time into deserts, and on these, as may be convenient to some parties or other, huge barracks are built to house the unfortunate people who have been displaced to create the desert. In the meantime, the displaced working men have housed themselves, not perhaps to their complete satisfaction, and certainly not to the satisfaction of those on whom some charges result from overcrowding. However, the Metropolitan ratepayer must pay for something, and Mr. Cross now seems to insist that he shall be let in for a good round sum for what are called street improvements and "improved dwellings for the "working classes." The Metropolitan Board of Works started gaily enough on their schemes for improvements. They bought land, hovels, and tenements at such prices as they could obtain them, and afterwards sold some of the sites at a ruinous loss. This, we may suppose, discouraged the Board in their efforts to improve the domestic circumstances of the working classes. They are now strongly urged by the Home Secretary to make another effort. He authorizes them, under the Streets Improvements Act, to find sites in substitution of those already acquired, it being always understood that inhabitants displaced shall be provided for before the tenements they occupy are demolished. But we are not told who is to erect the new buildings. The Metropolitan Board of Works acting as building speculators would be scarcely compatible with their present functions. They may, of course, offer to sell or to lease the lands. Supposing no one came to purchase or take the lands off their hands, then who is to provide the improved dwellings? The terms asked by the Board would certainly be high, and ordinary speculators would be frightened from entering into negotiations. The Peabody Trust are not for the moment prepared to enter upon further ventures, and the Labourers Dwellings Company are, we imagine, disinclined to build everywhere. Mr. Cross, however, insists that the Board shall go to work with energy; but in what direction their energy is to be exerted must be settled by the Works and General Purposes Committee, to whom the Home Secretary's letter has been referred. One passage in the letter gives us much satisfaction. It is that in which he directs that no building erected upon the new sites shall be more than five storeys high. We have often pitied the unfortunate labouring man who, after a hard day's work, had to toil up six flights of stairs to arrive at his lodgings, but have been consoled by the reflection that when once he had reached his home he would stay there, and not come down again to go to the public-house.

DEATH OF MR. A. F. JACKSON.—It is with much regret that we announce the death, at Putney, on the 26th ult., of Mr. Albert F. Jackson, who was so widely known as the able and courteous Secretary of the Imperial Continental Gas Association, from which position he retired last June, after 13 years service.

WE have received from Mr. Samuel Hunter, A. Inst. C.E., the Engineer of the Salford Corporation Gas-Works, two excellent framed photographs of the works. One shows the engine-house at the No. 2 station, with the tower scrubbers and the patent condenser (described in Vol. I. of our "Treatise on Coal Gas," p. 313) in the background. The other is a photograph of the double-lift holder in course of construction, according to the plans alluded to in Vol. II. of the "Treatise," p. 143. Both are exceedingly well executed, and make a handsome pair of pictures.

URBAN WATER SUPPLY.

In the JOURNAL of the 25th of November last we directed attention to a Blue-book issued about that date, the object of which was to show the means whereby water is supplied in the various Urban Sanitary Districts in England and Wales; and we have since endeavoured to obtain from the information that is there given some general results that may be useful to our readers.

We observe, in the first place, that the returns are very imperfect—important towns being altogether omitted, and many districts included, the population of which does not reach five hundred. Thus, to take only the towns in the Basin of the Thames, we fail to find any account of Abbotts-Langley, Amersham, Barking, Berkhampstead, Broxbourne, Chertsey, Dorking, Egham, Eltham, Ewell, Faringdon, Great Marlow, Hatfield, Hemel Hempstead, Hendon, High Wycombe, Hungerford, Kingsclere, Leatherhead, Rickmansworth, Shoreham, Walton-on-Thames, Wendover, Woking, and Woodstock. It is thus evident that the return must not be regarded as complete with regard to the Thames; and the same remark might be applied, and similar illustrations given, with regard to the other great drainage areas. It must also be stated that they are by no means brought up to the latest date. The Acts passed, not only in the last session of Parliament, but several years ago, are unnoticed, and the present state of works is rarely indicated. As the order for the return was made in May, 1878, and the return bears date July, 1879, more than a year was occupied in the preparation, and it is to be regretted that more care was not taken to give a correct account of the facts, and also to include all towns of importance.

There are in England and Wales certainly more than twelve hundred towns and urban districts, the population of which exceeds a thousand, and the returns are published for only nine hundred and forty-four, or about three-fourths of the whole number; these returns, moreover, including a considerable number of districts the population of which is much under a thousand. The arrangement is alphabetical with respect to counties, the counties being grouped as in the Census returns. No reference whatever is made to drainage areas. We must further add that the information as to sources is eminently barren and unsatisfactory. A large number of the replies to the queries as to sources give no further information than is obtained from the words "wells" and "springs." Now, it is clear that "wells" may be the worst or the best source; and unless there is some way of distinguishing them, the reply is of no value whatever. As to the word "springs," it is evidently used in many senses, and often applies to wells. In some replies we find the sources described as "land springs;" in many the wells are alluded to as "private;" and in many more the wells referred to are evidently supplementary to a regular supply from some established source. There is throughout a tendency to depreciate the value of the supply when afforded by a Company.

Notwithstanding these shortcomings—which are very real, and which require for their remedy a much more intelligent and careful system of replies to queries than those afforded by the Local Authorities in the cases where replies have been given—there is a great fund of information in the Blue-book before us; and, by combining it with other facts on record, we have obtained some valuable statistics. We have for this purpose made use of an essay by Professor Ansted, published with a map and several appendices, in the Report of the Annual Conference on National Water Supply, Sewage, and Health, held at the rooms of the Society of Arts, in May, 1879, pp. 43-64; and, assuming the districts there suggested, with some modification, we think a few valuable generalizations on the subject of water supply may be obtained. In the present article we limit ourselves to the Basin of the Thames, proposing afterwards to give similar statements with reference to the other great river basins of England—the Severn, the Trent, the Ouse, and some others less important. Our readers will do well to refer to the account of the Basin of the Thames on page 45 of the report alluded to, which appeared also in the *Journal of the Society of Arts* for the 25th of July last, where the physical facts relating to the basins and their statistics are given in some detail.

The Basin of the Thames is very clearly and naturally divided into two parts where the chalk hills cross its course between Wallingford and Reading. It is convenient to subdivide the part below Wallingford into two, the dividing line crossing the river near Teddington, where the tidal influence ceases. The whole water supply for the Metropolis being taken a little above this point, near Hampton, this division is especially useful for our purpose. Regarding the basin as a drainage area, it comprises (exclusive of the Medway system) 5425 square miles, and within it are nearly two hundred urban districts and towns of populations exceeding one thousand, of which the aggregate population a little exceeds five and a half millions. Averaging the urban population of the whole basin, there would seem to be one thousand human beings to every square mile; but, put in this light, the statement is eminently misleading. There can be no doubt that, if the population were equally distributed, and the sewage of all the towns carried into the river in equal proportions throughout its length, the Thames would at all times be in such a state as to be unfit for habitation on its banks; but the exact contrary of this is well known to be the case. We have not to deal with any generalization of this kind. The three divisions of the river, not very unequal in extent, are very unequal indeed in population, and especially in urban population. Thus, in the Upper Thames Valley there are only four towns on about 83 miles of river course, and 24 in the sub-drainage area of ten tributaries; and, the total urban population of this division being little more than 130,000, the average here is about nine acres to every human being. The only large town on the river is Oxford, which is supplied with water from a lake formed by excavations in gravel, the water being naturally filtered from the gravel. The sewage of Oxford is passed over land. Banbury, near the source of the Cherwell, is the largest of the towns on the tributaries, and it is also supplied with filtered river water. Swindon, at the source of the Cole, is supplied by springs. Of the other 22 towns, all smaller, we have only nine referred to in the returns, and they are all supplied by wells, some of which are deep, but others shallow.

In the district of the Middle Thames, which receives a large body of water, and through which the river flows for 51 miles, there are 21 towns on the main stream, and 44 on nine tributaries, the total population being, however, only 316,620. The drainage area is 1850 square miles, showing an average area of four acres to every individual. The extreme thinness of this population so near the Metropolis, and in a country so crowded as England, is exceedingly remarkable, and deserves careful consideration in reference to the use of the river water. The only large town on this part of the river is Reading, supplied with water from the River Kennet, and the largest town on the nine tributaries is Reigate, whose 16,000 inhabitants are supplied by wells. Of the towns on the river, only 13, including Reading, are alluded to in the returns, and all except those which take their supply from the London Water Companies (Hampton Wick, Surbiton, Kingston, Ham, and Teddington) are supplied by wells, some deep, but many of them superficial, and some very bad. Of the towns on the tributaries, 21 only are to be found named in the returns, and all of them (except Malden and Wimbledon in the Metropolitan supply) depending upon wells. The information with regard to almost all these towns is excessively meagre, and of 22 towns there is no record whatever.

In the Lower Basin of the Thames there are about 30 towns situated upon the river, and about 70 upon nine tributaries. The total urban population exceeds five millions, and the drainage area is 1675 square miles, thus showing a population of nearly five persons to an acre. Of course, the greater part are crowded into the 40 or 50 square miles that include the Metropolis and its suburbs; but the number of other towns situated on the river course (which amounts in all to 70 miles) and on the tributaries, especially the Lea, is very large. The Lea alone contains half the population on the tributaries. Of the towns on the river not supplied by the Metropolitan system, six out of eight are supplied from wells in the chalk. The others are not referred to. Of the towns on the tributaries, we find 34 named in the returns, and nearly as many not named. Upwards of 20 of those in the list are supplied by wells, and some of the rest by the Metropolitan Water Companies.

It will be seen by the above brief notes that the water supply of almost all the places within the Thames drainage area, mentioned in the returns, is obtained from wells of which there cannot be a doubt that a large number, if not a large proportion, are shallow, and obtain only the water draining from the surface into gravel. Such wells are all dangerous, and gradually become more so as the population increases. We must submit that a more searching investigation is needed than has been obtained by a few perfunctory replies to official questions, and that some account is due not only of the places from which replies have been vouchsafed, but from those numerous others to which no questions were sent or from which no answers were received.

One word more before we conclude. It is satisfactory to know, as a matter of fact, that so very small a proportion of the population of the Thames drainage area can have any

influence on the water supplied by the Companies from Hampton. It is also important, however, to bear in mind that, besides the sewage sent into the Thames by the Metropolitan sewage system at Barking, the river also receives that of a population of at least half a million from the various tributaries that enter it near and below London. We fancy this has sometimes been forgotten, in estimating the source of those sewage indications met with in the bed of the stream near London, and attributed to the conveyance of a part of the solid sewage back by the incoming tides. The Brent and the Wandle pass many towns, and the Ravensbourne and the Lea many more, all of which must help in the deposit of sewage mud on the Thames banks and bottom.

BERLIN MUNICIPAL GAS SUPPLY.

We have been favoured with a copy of the report on the working of the gas undertaking of the Berlin Municipality, for the twelve months from April 1, 1878, to April 1, 1879. From it we learn that the period of depression which has prevailed since 1873 has had great influence on the gas lighting of the city, in at least one direction. The consumption of gas increased yearly with the progressive development of commerce up to 1872, and in the period from 1873 to 1878 there was still a positive though diminished increase in the demand; but the past year showed, for the first time, a decrease in the total consumption. Taking into consideration the fact that during this period a good number of new services were laid, such decrease can only be ascribed to the slackness of trade, which has affected even the smaller manufacturers and shopkeepers, who have everywhere aimed at economy, manifested by the limiting of their gas consumption, or, in some cases, by the substitution of petroleum for gas. The actual decrease in the consumption was, however, very small, so that it had no influence on the financial position. Coals were cheaper, and the working results having turned out better than last year, the surplus realized was far in excess of the estimate.

During the working year, 1878–9, the production of gas at the four stations was as follows:—

	Cubic Mètres.
Stralauerplatz	7,705,000
Gitschinerstrasse	18,285,000
Müllerstrasse	19,282,000
Greifswalderstrasse	15,924,000
Total	61,196,000

The preceding year's production was 61,306,400 cubic mètres (2,160,830,760 cubic feet), thus showing a decrease in that of the past year of 110,400 cubic mètres, or 0·18 per cent.

The stock of gas in the holders on April 1, 1879, was 20,000 cubic mètres more than on April 1, 1878, so that the net production was—

For the year 1877–8	61,304,000 cubic mètres.
For the year 1878–9	61,176,000 „

The quantity of gas sent out during the past year was therefore 128,000 cubic mètres, or 0·21 per cent. less than during the preceding year. The year 1877–8 showed an increase of 3·675 per cent. as against the preceding year.

On April 1, 1879, the city gas-works supplied 11,717 public street-lamps, as against 11,479 on April 1, 1878, thus showing an increase of 238 lamps, or 2·07 per cent. for the year. The precise number of private burners in use was also counted, and a number of lights, the further use of which was doubtful, were struck out of the record. The number of burners in use on March 31, 1879, was thus found to be 614,133, as against 644,742 entered on April 1, 1878, showing a decrease of 30,609 burners, or 4·74 per cent. The total number of lights supplied by all the stations was therefore 625,850 on April 1, 1879, as against 656,221 on the corresponding day of the previous year, the net decrease being 30,371, or 4·63 per cent.

The gas consumed was applied as follows:—

	Cubic Mètres.		Per Cent.
Public lighting	8,301,531	or	14·828
Works and offices	607,625	„	1·085
Private consumption	47,074,946	„	84·087
Total	55,984,102	„	100·000

The total unaccounted-for gas, condensation, leakage, &c., was therefore 5,191,898 cubic mètres, or 8·487 per cent.

The proportion of gas used in public lighting shows an increase over that of the preceding year—viz., 14·828 and 14·266 per cent.—while the proportion of private consumption has decreased from 84·536 per cent. to 84·087 per cent. The reason of this is that the consumption of street-burners remains constant, the apparent differences from year to year being really caused by the addition of fresh burners at various times during the year; but there are many circumstances which influence the consumption of a private burner. Taking the time during which a street-burner is alight at 3675 hours yearly, with an hourly rate of 0·195 cubic mètre consumption, a public lamp will consume 716·625 cubic mètres in the year; but on account of the increase in the number of burners after April 1, 1878, the average yearly consumption of each appears to be 714·846 cubic mètres. The average consumption of each private burner during the year 1878–9 was 75·702 cubic mètres, which is below that of former years, as will be observed by the following table:—

1874–5	91·158 cubic mètres.
1875–6	85·201 „
1876–7	78·632 „
1878–9	75·702 „

The working period for 1877–8, which was only nine months, is not reckoned. The unaccounted-for gas, as before stated, amounted to 8·487 per cent. of the total production for the year, as against 8·696 per cent. in 1877–8, and 8·252 per cent. in 1876–7. The proportion has, therefore, remained almost stationary for three years, showing the care with which the alterations and extensions of the distributing plant have been carried on.

The maximum daily consumption, which usually occurs just before Christmas, was on the 5th of December, when there were general illuminations on the occasion of the return of the Emperor to Berlin. On that day 294,200 cubic mètres of gas were made at the four works; while the next greatest production, in the ordinary way, was on Dec. 17, 1878, and amounted to 289,800 cubic mètres. The maximum daily production in the preceding year was 299,800 cubic mètres on Dec. 21, 1877; the maximum of the past year was, therefore, less by 10,000 cubic mètres. The smallest daily production was on June 28, 1878, when 68,000 cubic mètres were made at the four stations. The maximum daily consumption was on Dec. 5, 1878, the day of the illuminations, when 322,000 cubic mètres were sent out. Leaving this day out of consideration, on account of the exceptional circumstances, the next heaviest consumption was on the 21st of the same month, when 305,000 cubic mètres were sent out, which is 2900 cubic mètres less than the maximum day's consumption of 1877. The maximum seven days consumption in 1878–9 was 2,065,300 cubic mètres, or a decrease of 1600 cubic mètres as compared with the corresponding figure of the preceding year, which was 2,066,900 cubic mètres. The maximum hour's delivery was between seven and eight p.m. on Dec. 5, 1878, during which time 38,800 cubic mètres were used; the next greatest being 37,250 cubic mètres, which was consumed between five and six p.m. on Dec. 31, 1878, or 1050 cubic mètres less than the preceding year's hourly maximum. The smallest consumption on any one day occurred on June 23, 1878, when 65,300 cubic mètres were sent out, as against a corresponding figure of 67,200 cubic mètres for the preceding year, or a drop of 1900 cubic mètres. The following proportions have thus been determined, omitting the illumination day:—The minimum daily consumption was to the maximum consumption as 1 : 4·67 (preceding year as 1 : 4·582); the maximum daily consumption was to the yearly consumption as 1 : 200 (preceding year as 1 : 199); the maximum hourly delivery was to the maximum daily consumption as 1 : 8·18 (preceding year as 1 : 8·04).

The coal carbonized in producing the 61,196,000 cubic mètres of gas in 1878–9 was 216,058·2 tons (of 1000 kilos), which makes an average of 283·24 cubic mètres (10,001·2 cubic feet) per ton. As, in the preceding year, only 279·71 cubic mètres of gas per ton were obtained, there is an increased rate of 3·53 cubic mètres (124·6 cubic feet) per ton. This favourable result is to be attributable partly to the improved quality of the coals, which are now better screened than formerly, and partly to the extended use of heating by carbonic oxide, which produces a more uniform heat in the retorts. It may also be mentioned that the amount of work done per head of the workmen employed is considerably increased, and also that the fire-bricks used have answered the heavy demands of generator stoking better than before. For the same reason the production of each retort in use has considerably increased, the yearly average per retort daily being as follows:—

Year.	Cubic Mètres.		Cubic Feet.
1875–6	201·0	or	7095
1876–7	220·5	„	7783
1877–8	230·2	„	8126
1878–9	242·2	„	8549

The favourable results of working have also permitted much economy in wages and fuel. The number of retorts in use (calculated for one day) was 252,677, with 1,420,317 charges. The duration of the charges was with generator furnaces about 4 hours; with other furnaces generally 4·8 hours. The greatest number of settings in use at all the stations in one day was 174, with 1226 retorts, on Dec. 5, 1878, with 7132 charges, as against 191 with 1309 retorts and 7119 charges in the preceding year. Of the total 252,677 retort working days, 117,676, or 46·6 per cent., were with retorts fired by generator furnaces, and 135,001 working days for retorts fired in the old way with grate furnaces. *In view of the favourable results obtained from generator firing, the system will be applied to all settings which have to be renewed, as far as other circumstances will permit.*

The quality of the gas has been almost uniform throughout the year, as shown by the photometrical observations taken at the works and at the testing-station in the centre of the city. The gas was always free from sulphuretted hydrogen, and the quantity of carbonic acid and ammonia was always trifling. The average illuminating power, as found by Professor Rüdorf at the central testing-station, was 17·2 candles; the minimum on three occasions was 16·5 candles, and the maximum was 17·5 candles on eleven occasions. No interruption of the manufacture took place at any of the stations during the year, the working having in all cases been perfectly regular.

The following new works and extensions have been made at the various works:—

Gitschinerstrasse Station.—Rebuilding 16 settings with generator furnaces; erection of a travelling crane for unloading materials.

Müllerstrasse Station.—Completion of gasholder of 31,500 cubic mètres (1,111,950 cubic feet) capacity; completion of residence, &c., in Sellerstrasse; gasholder yard partly enclosed and roads made; No. 2 purifying-house enlarged by an extra floor for revivifying space; additional 20 settings, with generator furnaces, erected in No. 3 retort-house; clearing for additional office room.

Greifswalderstrasse Station.—Additional twelve settings, with

generator furnaces, erected in No. 2 retort-house; erection of three scrubbers and two cast-iron tanks for condensation products; water-pumps fitted.

A great deal of extension and relaying of mains was done in the distributing department.

The following are the accounts for the year ending April 1, 1879:—

WORKING ACCOUNT.

	Year 1878-9.		Per 1000 C. M. of Gas. 1878-9.	1877-8.
	Marks.*	Marks.	Marks.	Marks.
To Coal	—	4,084,601	66·75	74·60
Fuel	—	575,842	9·41	10·19
Total	—	4,660,443	76·16	84·79
By Coke, breeze, and ashes	2,422,540	—	39·59	42·14
Tar	433,507	—	7·08	7·31
Ammoniacal liquor	122,186	—	2·00	1·93
Sundry products	55,551	3,033,784	0·91	0·55
Net cost of coal	—	1,626,659	26·58	32·86
To Purifying material	—	23,386	0·38	0·22
Wages	—	376,814	6·16	6·60
Total cost of manufacture	—	2,026,859	33·12	39·68
Land charges	—	5,985	0·10	0·06
Oven renewals	—	152,471	2·49	3·17
Repairs of buildings and apparatus	—	85,320	1·39	1·67
Repairs of plant	—	35,947	0·58	0·60
Taxes and insurance	—	111,119	1·82	1·18
Other working expenses	—	182,029	2·98	2·83
Management	—	541,073	8·84	6·74
Pensions	—	4,594	0·08	0·16
Expenses of private lighting	—	35,552	0·58	0·42
Public lighting	—	168,407	2·75	2·32
Bad debts	—	26,225	0·43	0·35
Total expenses	—	3,375,281	55·16	59·18
By Gas sold—				
Public lighting	1,106,871	—	—	—
Private ditto	7,615,674	8,722,545	142·54	142·31
Balance	—	5,347,264	87·38	83·15
Balance of meter-rents	—	163,171	2·67	2·50
Total balance	—	5,510,435	90·05	85·65
To Amortization	690,856	—	11·29	8·41
Amount deducted	1,099,338	—	17·97	15·63
Total	—	1,790,194	29·26	24·04
Balance	—	3,720,241	60·79	61·61
Interest	—	1,089,227	17·80	18·36
Net balance	—	2,631,014	42·99	43·25

GENERAL BALANCE-SHEET.

	March, 1878.	April 1, 1878-9. Increase.	Decrease.	March, 1879.
	Marks.	Marks.	Marks.	Marks.
Assets.				
Land account	5,338,296	32,580	—	5,370,876
Meters on hire	1,096,407	19,620	—	1,115,027
Apparatus	28,360,232	608,535	—	28,968,767
Stores	390,299	—	19,339	370,960
Goods	329,977	365,685	—	695,662
Products	460,768	—	208,154	252,614
Bad debts	3	—	—	3
Debtors	2,133,765	—	51,805	2,081,960
Bills of exchange, &c.	645,334	—	239,240	406,094
Cash	105,729	—	65,675	40,054
Reserve	90,350	153,797	—	244,147
		1,180,217	584,213	
Total	38,950,160	596,004	—	39,546,164
Liabilities.				
Credit of account	699,000	—	699,000	—
Credit of 1846	2,288,670	—	218,356	2,070,314
„ 1869	5,181,000	—	159,000	5,022,000
„ 1875	8,300,000	—	313,500	7,986,500
Coal insurance	96,599	—	96,599	—
Fire, &c., insurance	152,089	117,075	—	269,164
Renewals	9,409,757	1,099,338	256,160	10,252,935
Capital	9,309,000	—	—	9,309,000
Amortization	2,072,176	690,856	—	2,763,032
Caution-money	187,017	55,188	—	242,205
City Treasurer (separate acct.)	1,254,852	2,631,014	2,254,852	1,631,014
		4,593,471	3,997,467	
Total	38,950,160	596,004	—	39,546,164

HULL GAS SUPPLY.—Mr. James Baynes, jun., F.I.C., F.C.S., F.R.M.S., County and Borough Analyst, Hull, reports the following as the results of all his tests, during 1879, of the gas supplied in the East District of Hull, by the Sutton, Southcoats, and Drypool Gas Company:—

	Max.	Min.	Mean.
Illuminating power, standard sperm candles	16·53	15·71	16·00
Grains of sulphur per 100 cubic feet	20·37	11·00	16·09
Grains of ammonia per 100 cubic feet	19·76	6·43	10·53

Mean barometer and temperature in experiment-room: Barometer, 29·79; temperature, 58·28°.

* The value of the mark is about 1s. English.

Communicated Article.

THE HYDRAULIC MAIN.

By Mr. R. H. PATTERSON, F.S.S.

The Hydraulic Main was one of the earliest improvements in gas manufacture; and it is hard to conceive how the work was at first carried on without it. It is in universal use at the present day, although with various modifications; and its advantages are obvious, while its defects are not so. One of its great merits is held to be that it maintains a "seal" upon the retorts without any action or attention upon the part of the workmen—an invaluable advantage in country gas-works, where there is not such a supply of trained workmen as there is in London and the other large towns. On the other hand, it must be said that, even in new gas-works or retort-houses, it is almost impossible to fit each and all of the dip-pipes with such accuracy as to have a perfectly even or equal seal upon every one of them; and in retort-houses which are not newly erected, the Hydraulic Main itself has to be looked after, to see that no derangement of its level occurs from "settling" or accident. Indeed, I should think that in every large retort-house there are several dip-pipes which vary from the average and desired setting to the extent of an inch or even more. "An inch or more" is rightly held an important matter in the working of the Exhausters, yet such a difference is unavoidable as regards those Dip-pipes which are out of the proper levels. Further, when there are Exhausters, as is the case in all large gas-works now-a-days, the great advantage attributed to the Hydraulic Seal, of being self-acting, almost disappears. Most valuable and beneficial as Exhausters are, it must be remembered that they place the "seal" almost as much at the mercy of workmen as if there were no Hydraulic Main at all—as if the retorts were sealed or closed by some other arrangement which has to be regularly attended to by the workmen. The only difference is, that whereas in the one case (that is, when there is no Hydraulic Seal, and valves have to be opened or closed by manual labour) the want of attention has to be guarded against in the retort-house; in the other case (that is, when the hydraulic seal is employed), the want of attention has to be guarded against in the exhauster-house. Thus, since Exhausters came into use, it is hardly correct to speak of the Hydraulic Main or seal as a self-acting apparatus. It requires constant vigilance in the Exhauster-house before the hydraulic seal can be worked properly.

But the chief object of this article is not to deal with the Hydraulic Main from a mechanical point of view, but rather to carry further the facts and principles of my previous articles "On the Effects of the Contact of Tar with Coal Gas." I think I may say correctly, that the damaging effect of this contact, as it ordinarily takes place, upon the illuminating power of the gas, is now pretty generally recognized; and that the former idea, so much in vogue, of prolonging the contact between the tar and gas during the cooling or "condensing" process, is now seen to be erroneous. But what about the Hydraulic Main itself?

This question presents itself under two different aspects; and one of these has engaged the attention of gas managers for several years past. I allude to the "Anti-Dip" movement, and the invention of several kinds of apparatus for abolishing the Hydraulic Seal. The object of these inventions had nothing to do with the evil effects of the Tar-seal upon the illuminating power of the gas. Although Mr. Bowditch had clearly set forth chemical facts and principles which necessarily led to this inference, his doctrines had been entirely forgotten—or rather, I may say, they had never been noticed or appreciated at all. The Anti-Dip movement excited attention at the very time when the maxim in vogue was to keep the gas and tar in contact as much as possible, even during the cooling process; and the object of the inventions for abolishing the hydraulic seal was solely with the view of lessening the "pressure" or resistance to the flow of gas from the retorts, and thereby lessening the deposits of carbon within the retorts.

The Anti-Dip system, not merely as a proposal or as an experiment, but as actually adopted in large gas-works, is really of old standing. I found it in use at the Fulham works of the Imperial Company when I first visited them in 1868, at which time it was an unusual practice; and Mr. Kirkham tells me he first adopted it in 1851. Except during the drawing and charging of the retorts, the Hydraulic Main was inactive, and the gas was allowed to issue without passing through a hydraulic seal; and as no self-acting apparatus had then been invented, the opening and shutting of the valve was done by manual labour. It is a noteworthy fact that this Anti-dip apparatus of Mr. Kirkham's happens to be, to this day, perhaps the very best as regards lessening the contact between the gas and the tar—although, as already said, no one paid the least attention to the effects of this contact in those days, and the sole object of the invention was to lessen the back-pressure and the formation of deposits in the retorts.

Carbon-Deposits in the Retorts.

Upon this point I adhere to the opinion which I expressed during the controversy, or at least correspondence, which took place in the JOURNAL in 1875—namely, that the carbon-deposits in retorts are not formed, to any appreciable extent, from the elements of permanent gas, but of the *very heaviest* portion of the tarry vapours; which, if not deposited within the retorts, would inevitably find its way into the tar-well. It will hardly be questioned that the hydrocarbons which form the permanent and saleable portion of the gas, and which exist as chemical compounds, are the portion of the gas which will be deposited *last*—in other words, which will longest resist condensation; and as regards the tarry vapours, the quantity

of them which escapes from the retorts is so vast, compared with the carbon deposited within the retorts—in other words, there is so much of this most readily depositable portion of the hydrocarbons which escapes being deposited, that it is not reasonable to suppose that the carbon-deposits in the retorts consist in any appreciable degree of the chemical compounds which form permanent gas, and which are far less readily deposited. I speak, of course, of ordinary gas-works where Exhausters are employed; and I confidently believe that there is no appreciable loss of saleable gas produced by the carbon-deposits in retorts. In other respects these deposits are quite as pernicious as they are held to be. They are tar deposited in the wrong place—indeed, in the very worst place where such deposits can occur. If these remarks be correct, we must look to some other cause than the slight decrease of these carbon-deposits for an explanation of the gain—or, at all events, the alleged gain—of illuminating gas from the abolition of the Dip; and that gain I believe to be attributable to the gas not being washed with tar, as takes place where the Dip or Hydraulic Seal is maintained.

Pulsations of the Gas.

The formation of carbon-deposits within the retorts has recently been attributed by that ingenious and thoughtful investigator, Mr. Young, of Clippens, to the oscillations or pulsations of the gas. The gas has to make its way through the Hydraulic Seal in rushes or gulps; for the gas does not percolate through the water or tar, but has to force its way by successive displacements, the seal being alternately opened and then closing again. And Mr. Young holds that the carbon-deposits are almost entirely due to the pulsations thus produced in the gas; in other words, not so much to the back-pressure as to the manner in which it operates. I only venture to speak conjecturally on this point, but I cannot agree with Mr. Young. First of all, it should be remembered that such deposits will occur to some extent without any back-pressure at all, and owing to the mere fact that a portion of the gas must come in contact with the glowing sides of the retorts, whereby a portion of the constituent carbon tends to be solidified and deposited. Secondly, the longer this contact endures, the greater will be the deposits; always supposing that the heat of the retorts and the smoothness or roughness of their inner surface are the same. And as back-pressure tends to retain the gas in the retorts, the greater the back-pressure the larger will be the deposit of carbon. But the part which "pulsation" plays is very little, or, as I am disposed to think, none at all. For example, suppose that instead of passing a 3-inch seal, the gas had to escape through a pipe so small as to produce a back-pressure equal to 3 inches. Under such circumstances, I think the deposits in the retorts would be no more in the former case than in the latter. With a 3-inch seal, the back-pressure from the seal cannot exceed 3 inches at its maximum—that is, at one point of the oscillation; while at the other point the back-pressure almost disappears, because the seal is for the moment broken, and the gas rushes through. It seems to me, therefore, that the common opinion, which regards the formation of these deposits as dependent on the amount of the back-pressure, is the right one, and that the mere manner in which that back-pressure works (viz., by producing pulsations in the gas) is of very little effect.

But I am inclined to go further than this. It is held that these pulsations of the gas exist within the retort as well as beyond it. I do not think that such is the fact. Take a cistern, or any open vessel, and allow the water to rush out by alternately opening or shutting the outlet. You will see plainly that, beyond the outlet of the cistern, the water moves along the pipe or channel in rushes or pulsations; but you will not find such pulsations in the mass of water within the cistern. Each time the outlet is opened there will be a movement of water towards the outlet, but there is no back-flow. The water that has issued is gone, and the water which has been moving towards the outlet simply fills the place of the water which has escaped, and then comes to rest. Of course, as gas is being constantly generated, each time the outlet is closed there will be an increase of pressure within the retort—just as water will accumulate, and the level of the cistern will rise, if water continues to flow into it; but there will be no pulsation *similar* to what occurs in the pipes beyond the cistern. No doubt, when a flow either of gas or water is checked, there is a slight *internal* compression of the particles, greatest in front; but this is quite a different thing, and a bagatelle in comparison with the pulsations of the gas in the Hydraulic Main, where these pulsations are really waves or rushes produced by *external* pressure (viz., the outrush of gas from the mouths of the Dip-pipes), and which gradually die away in their onward progress.

Is all Back-Pressure Bad?

There is one aspect in which back-pressure in the retorts has not been sufficiently considered, and which I must plead in mitigation (not reversal) of the unanimous judgment that *per se* (that is, irrespective of its use in sealing the retorts) all back-pressure is bad. The chief object in constructing and working the retorts is to conduct the distillation of the coal at a very high temperature. The substitution of clay retorts for iron ones is held to have done even more good in this way than by the saving in the retorts themselves. It is not always an easy matter to get as high a heat as is desirable, and I could mention a very large gas-works of recent date where for several years the gas-make was far below the average, owing to the imperfect structure of the retort-benches, which prevented the retorts being heated to the proper point. Also, if one looks at the various new processes of gas-making, proposed or actually adopted, it will be found that, in one way or other, the real improvement is owing to a higher and a brisker heat during distillation. For example, look at Malam's process, which consists in making the gas, after being generated, pass through a mass of glowing coal heaped up at one end of each retort. This arrangement reduces by one-fourth the entire gas-making space in the retorts; yet the result is said to be to produce a larger quantity of gas (or, at least, of illuminating power) than before. Plainly, whatever gain there is in the employment of this process must proceed simply from the *higher temperature* to which the gas is exposed. The permanent mass of glowing coal must prevent the reduction of temperature during the early part of each charge, owing to the drawing and charging of the retort with cold coal; and, secondly, the gas-vapours, when produced, being passed through a mass of glowing coal, are subjected to a higher heat than gas which is withdrawn from the retort in the ordinary way—that is, by passing unchecked to the outlet between the top of the coal and the roof or sides of the retort.

Back-pressure will tend to produce much the same effect, by *keeping the gas longer subjected to the high temperature within the retorts.* In so far as greater heat converts a larger portion of the gas-vapours into permanent gas, this result will be promoted by a certain amount of back-pressure, and without using more fuel in the furnaces or any special arrangement within the retorts.

I make these remarks not from any doubt as to the extreme value of Exhausters, or as to the great loss which would attend a heavy back-pressure. But I think it important that this particular effect of back-pressure (viz., in subjecting the gas-vapours to a higher heat) should not be overlooked, especially seeing that, as already remarked, all the new or proposed modes of distillation appear to me to owe their good results to the single point of obtaining and employing a higher temperature.

Choking of the Dip-Pipes.

Another matter connected with the Hydraulic Main which has engaged the attention of gas-managers is the frequent choking of the dip-pipes in consequence of some portion of the tar in the Hydraulic Main being converted into pitch. It has generally been assumed that this formation of pitch is occasioned by the heat given out by the retort-bench; but Mr. G. Livesey has recently come to the conclusion (which manifestly is the correct one) that the real cause is the heat of the gas itself in the Hydraulic Main; for the heat of the entering gas is unquestionably greater than any which reaches and acts upon the Main from without. The remedy most commonly proposed is to increase the distance between the Main and the retort-benches, in order to lessen the heat; or else to attain the same object by thickening the walls of the retort-benches at the parts nearest to the Hydraulic Main. In regard to this latter proposal, it has often occurred to me whether it would not be more economical and otherwise advantageous to *thicken the entire external walls of the retort-benches.* The heat at present radiated from them detracts from the high temperature at which it is held desirable to conduct the process of distillation; and also, although this escape and loss of heat by radiation may be insignificant at any particular moment, it must swell to an enormous and very wasteful amount in the course of years. Look at a lime-kiln—how dense are its walls! And the action of a retort-bench is just like a kiln.

Mr. Livesey's remedy for choked dip-pipes does not lie in reducing the heat in the Hydraulic Main—which, as already said, he regards as necessarily produced in the main by the gas itself—but simply to diminish the depth of tar or liquor in the main—to make the main only deep enough for the purpose of maintaining the "seal," while allowing a free exit to the gas from the dip-pipes. By so doing, there are no corners or depths left where the tar may remain stagnant; the whole mass of fluid is kept in motion; and this simple change he finds sufficient to put an end to the grievous embarrassment of choked dip-pipes.

Contact between the Gas and Tar.

Another, and I think a most important matter connected with the Hydraulic Main, which has now begun to engage attention—in consequence of the recognition of the damage which may be done to gas from its contact with tar—is the speedy and constant withdrawal of the tar from the main, and keeping the liquor in the main to as great an extent as possible in the form of water. About six years ago, from considerations of my own as to the evil effects of tar upon the illuminating power of gas, I ventured to recommend "that every pains should be taken to keep the liquid in the Hydraulic Main as nearly as possible in the form of water, by drawing off the tar, and supplying water when needed. By this means," I said, "the bad effects of the tar-washing on the illuminating power would be reduced; and also another and wholly different advantage would be gained, because the pressure on the retorts would likewise be diminished." I had not at that time read Mr. Bowditch's book—which I have quoted largely, and made the *text* for my recent series of articles on the contact of tar with gas—nor, indeed, I should think, had gas managers read the book, or else they must have wondrously failed to appreciate it. But there was recently an interesting correspondence in the JOURNAL as to when, and by whom, an apparatus for drawing off the tar from the Hydraulic Main was first devised; and this much is clear, that this procedure was adopted merely for the purpose of preventing the tar from becoming too thick or pitchy for commercial use. As stated by Mr. Hall, of St. Andrew's (see JOURNAL for Dec. 16, 1879), who appears to have been one of the first to devise an apparatus for withdrawing tar from the Hydraulic Main, it was in order to prevent its stagnation, the pitching of the Main, and the damage done to the commercial value of the tar. In short, neither the drawing off of the tar, nor the movement for abolishing the dip, nor any other change which has been made or proposed in the Hydraulic Main, had anything to do with the object which is now rising into prominent attention—viz., the reduction or abolition of

the contact between the gas and the tar; while the method for preventing choked dip-pipes, by lowering the temperature of the Hydraulic Main, is diametrically opposed to that object, for it would necessarily aggravate the evil action of the tar upon the gas.

But, whatever may have been the motives for which these various changes upon the Hydraulic Main have been devised, let us see *where we are now going to.*

(To be continued.)

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

SAFETY LAMPS IN PURIFYING-HOUSES.

SIR,—Although I cannot pretend to say that the Engineer of the Bradford Corporation Gas-Works is in error, I can help to comfort "W." by giving my experience with safety-lamps, both old and new. When I joined the City of London Gas Company (Jan. 6, 1840), safety-lamps were in general use at their works in Dorset Street, Fleet Street, and had been, I presume, from 1825—the date, I think, of an order given by what was then called the Committee of Management, that no other moveable lights should be used upon the works. These commands were painted boldly on boards let into the walls at conspicuous points, and preserved by restoration to the end; consequently, we were never without the judicious warning, nor the safety-lamps either.

The old lamps were all that could be wished for as far as safety was concerned. They gave but little light, however, and therefore a lamp that would give more was sought for and found, the safety of which I never had reason to question. Mr. Armstrong, who made the first, has, to my mind, during the many years since gone by, produced the best forms that I have any knowledge of for the purposes of gas-works. I say forms, because I consider that more than one sort is required, and for this reason: A gas-works should be furnished with as few fixed lights as possible, therefore those men who have to get about much should be provided with lamps so glazed as to diffuse the light, whilst those whose business it is to inspect gauges, thermometers, registering apparatus, &c., should carry lamps that, when so directed, throw a strong light on any particular spot. With such a lamp one man can send the light in the direction of danger, whilst another advances to see what is the matter, thereby gaining the advantage of a good light with the augmentation of safety.

There were three accidents in my time, two of which, one by day and the other by night, would not have happened if the order referred to had not been disregarded. The third must for ever remain a mystery, as the only man who was near the spot did not survive the injury received at the time. This also was by day.

The most severe test that I am prepared to mention occurred one winter's evening, about six o'clock, when the make was over 100,000 cubic feet per hour. The valve-man came to me in great haste to say that something was wrong, because both meters had stopped. I immediately went to the purifying-house, at the door of which I met the man whose business it was to attend to that portion of the work, with his safety-lamp, he also having heard that something was amiss. This man, without a moment's hesitation, entered the building, and proceeded to stop the mischief by bye-passing and shutting the inlet and outlet of a vessel, the pressure in which had blown the water out of the seal-cup. It is true we were not long exposed to danger, as the operation just mentioned was simply opening one valve and shutting two others; therefore, whether our escape was due to mere coincidence, or to the fact that a properly *constructed* and properly *found* lamp was the cause, is not for me to enter into now. I merely give my own experience.

Jan. 2, 1880. W. MANN.

SIR,—In reply to your correspondent "W.," in your issue of last week, I have to support Mr. Swallow, the Engineer of the Bradford Corporation Gas-Works, in his assertion that "safety-lamps are no safeguard against explosions;" but I could scarcely go so far as to say "it would be dangerous to approach the purifying-house with a safety-lamp," unless I prefix the words, *under certain circumstances.*

I give this opinion from the experience of several fires, and narrow escapes therefrom, through the use of Davy safety-lamps in the purifier-house. Under certain circumstances, it would be highly dangerous to have a safety-lamp in such a place. WILLIAM KEY.

Gas-Works, Tradeston, Glasgow, Dec. 31, 1879.

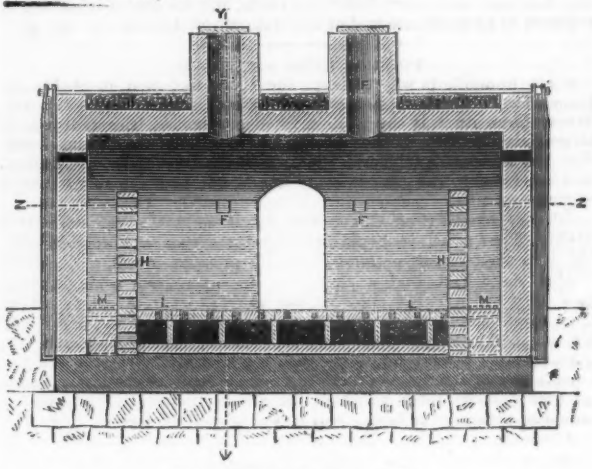
THE REVIVIFICATION OF SPENT LIME.

SIR,—When we consider what a vast amount of the lime used for the purification of coal gas is, by the sulphur compounds, converted into a most noxious ingredient, and by the carbonic acid into an article which, though inodorous, is of great bulk, without any useful property or value, it is obvious that every plan devised for the restoration of its exhausted function must be a step towards economy and order in connection with the manufacture of gas, and therefore should not be lost sight of whilst there appears room for any improvement. Hence the reason for what follows.

The lime having been fouled by exposure to impure gas, must, in order to change it back again to what it was before use, be submitted to certain degrees of heat, the last of which must be intense, and so applied as to permeate the mass. Now, how to bring this sulphuretted and carbonated mixture to the fire, and how best to apply the heat to its re-quickening, at the least cost, and without creating a nuisance during removal from the purifying vessels to the fire, and during the firing process, is what has to be well provided for in any plan that the deviser may hope to be considered equal to the elimination of the difficulty involved in the using of lime only once, and then having to deal with it as a waste product.

As regards Mr. Hislop's method of converting into quicklime the spent lime of gas-works, all the readers of the JOURNAL are pretty well informed. The simplicity of the arrangement cannot be doubted, and the cost of the operation is given by men whom we have no reason to question; but the sanitary character of the works using such a plan on a large scale is debateable, and, consequently, the whether or no must be left for practice to decide. The invention patented by Messrs. Hislop and Young (see JOURNAL for Nov. 18 last) can hardly be pronounced as a simple arrangement, there being too much of the millwright's art about it; but still, as the fire is inside and the gear out, more may perhaps be accomplished by the device than at first sight appears. This being admitted, it is an improvement on what has been before proposed for the purpose, and time will speak as to its possible duration.

My object in writing is to call attention to an invention of Mr. Asa W. Williamson, of New York City, in the specification of whose English patent (No. 2576, dated June 24, 1878) it is stated that "the difficulty heretofore experienced in re-burning lime of this character [*i.e.*, lime which in purifying gas has absorbed moisture, ammonia, carbonic acid, and sulphur] has arisen from the powdery character of the lime preventing the flames from permeating the mass, which action is necessary in order to drive off the substances named. By pressing the lime into bricks this difficulty is avoided."



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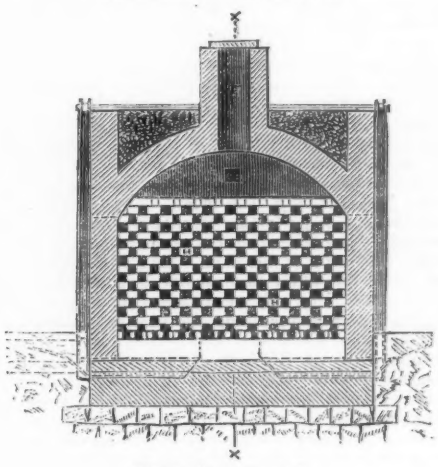

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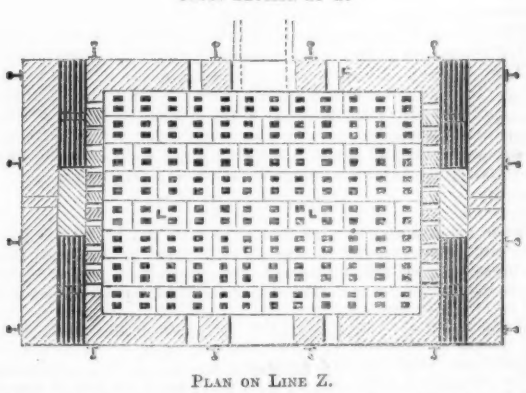

PLAN ON LINE Z.

The following is the procedure at the New York Mutual Gas Company's works, where the patent is in practical operation, and the accompanying illustrations show the apparatus:—The spent lime is carted to a large room, where it is pressed into the form of blocks 6 in. by 6 in. by 12 in., by means of a brick-making machine of suitable construction. From this room the bricks are taken to the oven or kiln. This is an arched chamber with furnaces in each end 16 in. by 4 ft. 8 in. The furnaces, M M, are divided from the oven by perforated walls, H H, 6 feet in height. The kiln is 10 feet wide in the clear, 8 feet high,

and 14 feet long between the perforated walls, H H. The floor, L L, is perforated, and overlies a chamber into which the products of combustion and "burning" descend prior to their passage to the chimney by the main flue. The kiln is entered for charging and discharging through doorways, one on each side. For cooling the contents of the kiln there are two vertical ventilating flues, and two small openings just below the springing of the arch, all of which are marked F F, provided with dampers as well as the main flue. The blocks or bricks, when formed by the machine, are piled up with ample spaces between them for the circulation of heat, as is customary in "piling clay bricks in the kiln."

The patentee says "the bricks will shrink in size as they lose carbonic acid, sulphur, and the like, and from such shrinkage it can be ascertained about when the kiln is burned. From 20 to 36 hours should be sufficient to accomplish the object. By adopting this process the lime may be used an indefinite number of times, as by each burning it is converted into caustic lime, only requiring slaking to convert it into the hydrate, and fit it for the purifying-boxes again, or for other purposes for which caustic lime is used."

At the works of the Mutual Gaslight Company, New York, the same lime has been used more than forty times, and the cost of reburning is reported to be about one-half of the first cost of the lime. W. M.

FROZEN LAMP SERVICES.

SIR,—Observing in last JOURNAL your request as to remedies for frozen lamp services, I have pleasure in giving my experience in the matter. When the weather is severe, and the lamp services become frozen in large numbers, the gas manager's position is a most unenviable one. The dark streets provoke criticism even more severe than the weather, and for the time being the gas company and their manager are extremely unpopular.

For several winters this has been my position, and although many experiments have been made, they resulted only in failure, until within the last month, when a plan was hit upon which has proved most effectual.

Pour 4 drachms (or thereby) of hydrochloric acid into the frozen pipe, and immediately after this fill up the pipe with hot water. In five minutes or so, a complete clearance will be effected. A pint or two of hot water should then be poured down the pipe, to "kill" or dilute the acid, and this will find its way to the nearest syphon.

Care must be taken to thoroughly cleanse the pipe of all traces of the acid, as a quiet but certain process of corrosion might set in, which would be most destructive.

I hope my cure may be of some service to the afflicted.

Gas-Works, Bury St. Edmund's, Jan. 1, 1880. JOHN M'CRAE.

THE PORTER-CLARK PROCESS FOR PURIFYING AND SOFTENING WATER.

SIR,—Your own comment at the foot of my letter published in your issue of the 23rd of December, and Professor Ansted's friendly letter in your last, appear to invite some response from me upon the question of the cost of the Porter-Clark process if applied upon the large scale of town supplies. I therefore send for your information a paragraph or two upon that point, taken from a little pamphlet printed in May, 1878, and circulated at the Society of Arts Congress on National Water Supply. I enclose a copy of the pamphlet, which is descriptive of what was being prepared, and has since been in operation, for the town supply of Swindon:—

"It is expected that the interest upon the cost of the plant and buildings, and the cost of working, will amount to about 1d. per 1000 gallons upon 280,000 gallons treated daily.

"Where the quantity amounted to 1 million gallons daily, comparatively slight increase in the proportions of the apparatus would admit, relatively, of considerable reduction of cost in wages, in the plant and machinery generally, and in the building; so that the patentee names from 0·5 of a penny to 0·6 of a penny per 1000 gallons as the maximum, to be yet further reduced as the quantity to be dealt with increased."

In a priced list I have issued recently I have put the cost of the plant (exclusive of building) for 100,000 gallons per hour at £5500; the space occupied at 5000 square feet; and the weekly expenses of working at £10. I do not seek, Sir, to advertise my affairs gratuitously, but I wish to show that I am very far from being shy of announcing the cost.

Now, it is true that my friends of the London Water Companies smile good-naturedly at my simplicity in suggesting ¼d. per 1000 gallons in addition to, or even in lieu of their present charges for filtration; and, like yourself and Professor Ansted, they say that no particular benefit would result to the consumers generally from water thus softened and filtered. I will not seek to occupy your space by a parade of more or less distinguished names in opposition to your views; but for myself and my own household, consuming for all purposes, possibly, 100 gallons of water daily, for which I pay the Lambeth Water Company at the rate of something over 2s. per 1000 gallons, I certainly would gladly pay 36¼ farthings, or even pence, per annum in addition, for the comfort, cleanliness, and economy I should derive from using water of 3·5° of hardness, instead of that which now gives me, instead of soft lather, curds of lime-soap, neither agreeable to see nor to carry about in the pores of my skin, and solidified in my shirts and under-garments.

The valuable little work on "Water Analysis," by Messrs. Wanklyn and Chapman, to which Professor Ansted refers in his own work on "Water and Water Supply," explains that "the more lime or magnesia in the sample of water, the more soap a given volume of the water will decompose so as to give *insoluble* oleate, palmitate, and stearate of lime or magnesia, and consequently the more soap must be added to a gallon of water in order that the necessary quantity of soap may remain *in solution*, so as to give rise to the phenomenon called 'lathering.'" And, as Mr. Jarmain, F.C.S., in his lectures at the Society of Arts, puts it, "The *insoluble* soap so formed cannot be washed out of the wool or fabric, to which it attaches itself with great tenacity. . . . Even during the rinsing or washing of the wool or fabric where soap has been used, the mischief is increased by the fresh water acting upon the excess of soap which has to be used to obtain a scour. This excess is also converted into insoluble soap, and is added to that already formed."

On this point Professor Ansted remarks that the softened chalk water at Banstead is not used in the laundry there. That is so; for, having many acres of clean slated roofs, the architect excavated an enormous reservoir for the storeage of rain water for laundry purposes, the softened water being designed for the use of steam-boilers and heating apparatus, and this is the purpose which the magistrates certify it has "satisfactorily answered." In saying that, they could hardly have ignored the question of economy—on the contrary.

In relation to manufacturing and industrial uses—to which, indeed, the specification of my first patent particularly points—I venture to add the following figures from another paper I have issued, for I have reason to know that this has a special interest for water companies in certain localities:—

"Taking the total cost at 2d. per 1000 gallons, and applying it to 100,000 gallons per day, we have 16s. 8d. To evaporate 100,000 gallons, or 446 tons of water, in boilers encrusted, as they commonly are, by hard water, 56 tons of coal would be consumed; whereas, with water deprived of its lime by this process, 50 tons would serve. The 6 tons at 10s. per ton, less the cost of the softening, gives £2 3s. 4d. as the daily saving—in round figures, £600 a year. Mr. Duncan has paid £500 a year for removing incrustation from boilers thrown off work; the pipes of his costly 'Economizers" became choked, so that the value of that source of heat was lost; but, with the Porter-Clark process, he is putting in new 'Economizers.'"

Tudor Street, Blackfriars, London, Jan. 1, 1880. JOHN H. PORTER.

Legal Intelligence.

PONTYPOOL POLICE COURT.—SATURDAY, DEC. 27.
(*Before Colonel* BYRDE, *Chairman; the Rev.* J. C. LLEWELLIN, *and Mr.* E. J. PHILLIPS.)

WILLIAMS *v.* THE PONTYPOOL GAS AND WATER COMPANY.

In this case, the Pontypool Gas and Water Company were charged, at the instance of Mr. John Williams, an innkeeper, with failing to comply with one of the provisions of their Act of 1873—viz., the construction, within 2½ years of the passing of the Act, of a reservoir for the supply of water.

Mr. A. J. DAVID appeared in support of the information; and Mr. A. T. LAWRENCE represented the Company.

Mr. DAVID, in stating the case, said it was an information laid by a Mr. John Williams, against the Pontypool Gas and Water Company, under the following circumstances. The Company, in May, 1873, obtained an Act of Parliament giving them certain powers, and enforcing upon them certain conditions which they would have to fulfil in consideration of the granting of the Act. Among the provisions contained in the Act there was one for the making of a reservoir at Nant-y-Mailor, for the supply of water, and which should be made capable of holding 4½ million gallons of water. Section 47 of the Act enacted as follows:—

The Company shall within two years and six months after the passing of this Act complete to the satisfaction of the Board of Trade the existing reservoir on the stream or brook called Nant-y-Mailor, so that the same shall be capable of holding not less than four million five hundred thousand gallons; and if the Company fail within the period aforesaid so to complete the said reservoir, then the Company shall be liable to a penalty of twenty pounds a week for every week after the expiration of the period so limited until the said reservoir is completed as aforesaid.

The Act was passed on May 26, 1873, and up to the present time the Company had not constructed the reservoir, which meant that from Nov. 26, 1875, up to Dec. 2, 1879, they had failed to comply with the Act. This did not concern him or his client alone, but the public generally. He (Mr. David) contended that on the face of it the Act had not been complied with, and the Company were now liable to penalties amounting to £4200. It might be argued that the penalty should have been applied for within six months of the commission of the offence—namely, on Nov. 26, 1875; but his argument was that it was not a separate or divided offence, but a continuing one, for which the Company would be liable to penalties after the expiration of the date for completion of the reservoir. Mr. Williams was a man who had good cause of complaint. He was a tradesman in the town, and in the course of his business, as a publican, had been prevented from following out his intentions on account of the deficiency of water. Within the last two years—within two or three weeks—there had not been a sufficiency of water in consequence of the want of this reservoir, and in some places in Pontypool there had been no water at all.

Mr. LAWRENCE said that Mr. Williams was merely a public informer.

Mr. DAVID said at the same time his client was entitled to take these proceedings, and the law sanctioned it. It was quite enough to show that the Act had not been complied with, in order that the penalty which was stated in the Act could be recovered. The way in which the penalty was recoverable was according to section 136 of the Lands Clauses Consolidation Act, 1845, which was as follows:—

Every penalty or forfeiture imposed by this or the special Act, or by any bye-law made in pursuance thereof, the recovery of which is not otherwise provided for, may be recovered by summary proceeding before two justices; and on complaint being made to any justice, he shall issue a summons requiring the party complained against to appear before two justices at a time and place to be named in such summons; . . . and upon proof of the offence . . . it shall be lawful for such justices to convict the offender, and upon such conviction to adjudge the offender to pay the penalty or forfeiture incurred, as well as such costs attending the conviction as such justices shall think fit.

The Company had committed an offence under their private Act which rendered them liable to a penalty of £20 a week for 210 weeks, or an aggregate of £4200. The offence for which the Company were indicted was not a separate or divided one, but was a continuous one; and therefore the six months under which an order should be made for enforcing the penalty did not apply. Was it to be said that this six months barred jurisdiction when it was a continuous offence? He thought not, and held that the Company were liable.

Mr. LAWRENCE said he would at present only proceed to urge the objection which his learned friend had said would be taken—viz., that the proceedings were out of date. Mr. David had called attention to the section for the recovery of forfeits, but he (Mr. Lawrence) would in return direct attention to the 142nd section of the Lands Clauses Consolidation Act, which imposed a limit of six months for the recovery of penalties, and which especially applied to the clause under which this case rested. It was as follows:—

No person shall be liable to the payment of any penalty or forfeiture imposed by virtue of this or the special Act, or any Act incorporated therewith, for any offence made cognizable before a justice, unless the complaint respecting such offence shall have been made before such justice within six months next after the commission of such offence.

He then proceeded to quote several cases in which it was declared that proceedings must be taken before the expiration of this period, and if such notice was not given in the time it could not be given at any other. For

neglecting to construct the reservoir it was contended that the Company were liable to certain penalties. They, no doubt, were liable, had notice been taken of the matter before the time fixed by law for such proceedings. The 142nd section of the Lands Clauses Consolidation Act said that proceedings must be taken before the expiration of six months next after the commission of the offence. He was not aware of any case—in fact, he might take upon himself to say that there was no case—which was like the present. He had consulted many authorities, and they showed that the section limiting the time of notice to six months was a most imperative one. The grounds upon which the proceedings were taken were of the most trivial nature. For the satisfaction of the Board of Trade, an Inspector was sent down after the period had elapsed for carrying out the improvements of any private Act, and if in this case the reservoir had been a public want, it would have been insisted upon. Because a common informer came forward, not only all the Shareholders in a concern, but their families, might be literally ruined. It was a very wise provision of the Legislature, which prevented lurking people going about for no purpose, and inflicting incalculable harm upon others. He said nothing about whether good, bad, or indifferent reasons existed for these proceedings. He believed—in fact, he was instructed to say—that there was no complaint about the supply of water in Pontypool, which was as pure and good as any in England. They were simply brought to a poor question of law, and he believed there could be no doubt that it was the universal custom to consider the words of any Act of Parliament as applying literally. No doubt the offence was an existing one in September, 1875, but he was at a loss to conceive how these six months should have lasted until December, 1879.

Mr. DAVID said all he would ask the Court to do was to amend the information by adding the words, "and to such offence continuing to this day," that is, the date of issuing the summons. He did not pretend to say that between September, 1875, and December, 1879, more than six months had not passed, but he claimed that the offence was one of a continuous nature.

Mr. PHILLIPS remarked that the law was clear—it distinctly said the six months "next" after the offence. He thought the complainant ought to have given notice within this period of the commission of the offence, and the objection taken by Mr. Lawrence was fatal.

Mr. DAVID said the only thing was the question whether this was a continuous offence. It might be that they were entitled to recover penalties after the expiration of the six months in which notice might have been given. If they had moved at the appointed time, they would have been entitled to six months penalties, and nothing more, but they would have been entitled to come again. Justice Mellor said the limitation of six months did not apply where a continuous offence existed. This was the nearest authority he had been enabled to lay his hand upon. It was a matter open to debate, he was perfectly aware, and it was hardly to be expected that his learned friend and himself would agree upon the construction of the law.

Mr. LAWRENCE said he did not pretend to say that he found a case upon this question. He might take it upon himself to say there was no case upon it, but in similar cases it had always been held that the six months limitation was imperative. He then proceeded to quote several cases, and read the decisions of Justices Blackburn and Lush, who maintained that such a contention was a *reductio ad absurdum*. They had decided that inasmuch as the order was not made within the six months, proceedings would not stand afterwards. These authorities went to show that common sense alone would prove the hardship of such an application as the present one being made, as well as its inconsistency. It was perfectly clear that if these proceedings had been taken within the limitation period, the Company would have been liable to a penalty of £20 a week. As it was, it was of no use taking up the time of the Bench.

Mr. DAVID said he could simply refer to what evidently must have been the intention of the Legislature at the time the Company's Act was passed, and he thought the Bench would be guided by that. The Legislature could have made the penalty a lump sum, but they said, "If the Company do not do the work within a certain specified time, they shall be liable to a weekly penalty;" and, therefore, he contended this was a continuous offence. They were, therefore, entitled to recover all these penalties. If they were entitled to six months penalties, they were entitled to all.

The Bench retired. After a brief absence, they returned into court, and

The CHAIRMAN said that when the Company's Act was passed there was no doubt, the Magistrates thought, that it was intended to compel the completion of work in the specified time, and it was reasonable to conclude that, in default of taking proper measures to complete the work within the reasonable time which the Legislature had fixed, the Company were open to penalties. It had not been proved that any damage had been sustained, but they agreed that the Company would have been liable if proceedings had been taken within the specified time. The Bench, however, were of opinion that the provision in the Act had not been complied with, that the word "next" was fully applicable in this case, and the summons would therefore be dismissed.

Mr. DAVID asked for a case for the consideration of the Court above.

The CHAIRMAN said that although, so far as the Bench were concerned, it would be difficult to state, they were prepared for such an application, and as the matter was one of great importance they would grant a case.

Mr. DAVID asked the Bench that, as this was a case for the Court above on a technical point, they would not dismiss the summons.

Mr. LAWRENCE said he should offer no material objection, for, if the Court above were of opinion that the limitation did not apply, the case would be sent down to this Court for hearing.

The complainant then entered into recognizances, and the case so far terminated.

REDUCTION IN THE PRICE OF GAS AT STOURBRIDGE.—At the meeting of the Stourbridge Commissioners on the 29th ult., it was announced that from and after the 1st inst. the price of gas would be reduced 2d. per 1000 feet.

IN reference to the paragraph which appeared in the JOURNAL of the 23rd ult., announcing that Mr. Robert Fish, of Bucharest, had been decorated with the Order of Chevalier of the Star of Roumania, for conspicuous services in maintaining the lighting of the city during the period of the late war, the Bucharest *Curierul Financiar* says that the general impression prevailing in Bucharest is that no reward was better merited, for at the time when the navigation of the Danube was interrupted, and communication with England was impossible, Mr. Fish maintained the lighting of the city for several months with very little coal, and produced his gas from other materials. With a less able man at the head of the gas-works, Bucharest would most assuredly during that period have remained in darkness, and the Company been compelled to spend very large sums of money in the substitution of candles or petroleum for the public lighting. Beyond professional ability of a high order, Mr. Fish possesses a thorough desire to fulfil his duties conscientiously, and to give satisfaction to, and gain the respect of those among whom he has taken up his abode—qualities which are the more appreciated for their rarity in most of those who visit Roumania.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in December, 1879:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.—As Nitrates, &c.	Ammonia.		Hardness (Clark's Scale).	
				Saline.	Organic.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	22·50	0·060	0·195	0·000	0·008	15·4	4·2
West Middlesex	22·90	0·056	0·210	0·000	0·008	15·4	4·2
Southwark and Vauxhall	23·10	0·049	0·180	0·000	0·006	14·8	4·2
Chelsea	21·10	0·052	0·180	0·000	0·008	14·3	4·2
Lambeth	22·10	0·052	0·180	0·000	0·008	14·3	4·2
Other Companies.							
Kent	31·10	0·012	0·450	0·000	0·004	21·2	7·0
New River	21·90	0·023	0·200	0·000	0·007	13·7	3·7
East London	23·50	0·073	0·195	0·000	0·008	14·8	4·6

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOTT TIDY, M.B.

THE PUBLIC LIGHTING OF DUBLIN.

At an Adjourned Meeting of the Municipal Council of Dublin on Monday, the 29th ult.—the HIGH SHERIFF (Alderman H. Tarpey, J.P.) in the chair—the question of the lighting of the city was under consideration, in consequence of the action taken at the previous meeting of the Corporation, on the 15th ult., when a letter was read from the Town Clerk, stating that the Committee nominated to consider the terms of a new contract for the public lighting of the city had on Dec. 2 addressed a letter to the Alliance and Dublin Gas Company, requesting information as to the terms on which they would contract for the supply of gas. The reply of the Company proposed to contract for three years at the ordinary price charged for gas within the city, and with a charge the same as at present (of 4s. 6d. per lamp per annum) to cover the cost of repairs, painting, and meter-rents. The Committee thereupon reported to the Council their opinion, "arrived at after careful consideration, that the price of gas should not exceed 3s. 6d. per 1000 feet in Dublin, and that the proposal of the Company is most unsatisfactory to the citizens, as not containing any intimation of a substantial reduction of price in the immediate future, having also in view the now established prosperous circumstances of the undertaking." They also recommended "that if an equitable arrangement can be effected with the present Gas Company, it should embody an agreement entitling the citizens to a discount on the public lighting account, in view of the large consumption, seeing that the Company have recognized this principle in their dealings with the other large consumers." The Council then resolved to refer the Company's letter back to the Committee with instructions to communicate with the Company with a view to getting better terms.

The TOWN CLERK now read the following letter, which had been addressed to him by Mr. W. F. Cotton, the Secretary and Manager of the Company:—

Dear Sir,—I am directed to acknowledge the receipt of your letter of the 16th inst., and in reply to state that my Directors regret the Committee nominated to consider the terms of a new contract for the public lighting of the city did not feel justified in recommending the Municipal Council to accept the terms named in my letter of the 10th inst. The terms offered by the Company would enable the Corporation to carry out the public lighting of the city at a cost per lamp per annum not exceeding the price paid in London—a fact which must be apparent to the Committee who have procured a return of the cost in London and other places.

The Committee are aware that in London and other large cities and towns the Local Authorities provide the whole of the public lighting plant, whereas in Dublin the Company have expended a large amount of capital in providing similar plant, the Corporation having the use of same free of charge, not even paying the interest upon the capital invested.

My Directors are most anxious to be in a position to reduce the price of gas. They have done so voluntarily on several occasions during the past five years, and although they cannot do so at present in the face of nearly all materials used by gas companies advancing in price, they will take the first opportunity for making a reduction, not alone to the Corporation, but also to the consumers in general.

In conclusion, I am to state that should the Committee consider the Company's terms unreasonable, they can take advantage of the law which governs such cases throughout the kingdom, and go to arbitration to fix the price, thereby affording an opportunity, before an impartial tribunal, of either proving or disproving the statements which have been made in the Municipal Council. (Signed) W. F. COTTON.

Dec. 24, 1879.

Mr. MAYNE (Chairman of the Gas Committee) said they were in the position that almost at the eleventh hour they found the Company refused to make any concession whatever. The Committee would have to approach them again, but it was almost too late to hope for much. In the meantime, some arrangement should be made for the ensuing twelve months.

Mr. M'EVOY said the Council must do something. The Act of Parliament referred to in Mr. Cotton's letter was the Gas-Works Clauses Act of 1871, the 24th section of which provided for an arbitration as to the prices local authorities were to be charged for gas. He knew that private consumers in Dublin were getting gas at 3s. 11d. per 1000 feet, and he did not think any arbitrator would award a higher payment than this for the public lights. There was no alternative but to have a legal notice served on the Company, calling on them to supply gas to the city for one year, and apprising them that the Corporation were prepared to go to an arbitration as to the amount to be paid. If the Council should think fit to suspend the Standing Orders, he would move a resolution to that effect.

Mr. GILL asked Mr. M'Evoy if he knew at what times the private consumers, to whom the price of gas was brought down by a discount to 3s. 11d. per 1000 feet, paid the Company; also, did he know that the Company had not been paid a penny by the Corporation since last April.

Mr. GRAY, M.P., said the proposal of Mr. M'Evoy was a very serious one, and would require a little more consideration. No doubt the Corporation would be able, before an arbitrator, to make out a case for compelling the Company to supply them with gas at as low a rate as they supplied it to private consumers—namely, 3s. 11d. per 1000 feet; but, on the other hand, the Company could advance a claim to be paid for the lamps, &c., and might, in this way, succeed in running up their charge even to more than 4s. 3d. per 1000 feet. The question required careful consideration before they rushed into it; though he himself thought they ought to have an arbitration and a full public investigation of the whole matter. Even if the arbitration did not give them so large a pecuniary result as they might expect, it would bring the whole facts authoritatively before the public, and in this way would do good.

The Company might think they were only charging a fair rate, and, if so, they could have no objection to going to arbitration. But another consideration was that it would be unfair to take the matter out of the hands of the Committee to whom the Council had referred it. What he suggested was that they should ask the Company to continue the supply of gas for the present, pending the report of the Committee, which they would have in a fortnight; and if this report recommended that the Council should go to arbitration, the notices could be served.

The HIGH SHERIFF said he agreed with the Lord Mayor Elect (Mr. Gray) that this was the proper course to pursue. Though he had not intended to take part in the discussion, he could not refrain from denying statements that had been made in the Council Chamber upon a recent occasion. He promised the Council that if the question were to go to arbitration the Company would get out of it with clean hands, and would show the public that, under the circumstances of the case, gas was sold considerably better in Dublin than in any other city in the United Kingdom. It had been stated that gas was sold in Belfast at 3s. 6d. per 1000 feet. True, and he was not at all surprised at it, considering that the Corporation of Belfast had borrowed money at 4 per cent. He was only sorry that the Corporation of Dublin had not pursued the same course when they had an opportunity, and purchased the gas-works; but to say that under present circumstances their gas could be compared with the gas in Belfast, was one of the most ridiculous ideas that ever emanated from the mind of any respectable man. As to London, they never could compare Dublin with London. For instance, freight was 5s. a ton higher from Newcastle (where the Company got their coal) to Dublin than to London. It had further been stated that no reduction in the charge for gas had been made in Dublin for the last 12 or 14 years, except one of 3d. per 1000 feet; but it was forgotten that the illuminating power of the Dublin gas had been greatly increased. He recollected gas being sold, at the old price, having the illuminating power of 10 or 12 candles; and every candle added to the illuminating power was worth 3d. Assuming that the gas in 1866 was 12-candle gas, it was now 16-candle gas with a flat-flame burner, and this in reality made it equal to 18-candle London gas, so that there was a concession of at least 1s. in quality if not in price. There was no body of men in existence more anxious to look after the interests of the consumers than the Gas Company, but they certainly would not be driven into making a reduction in this manner; and if ever a reduction took place Mr. Mayne would not get the credit of it—it would come spontaneously from the Company themselves. It would be much better for Mr. Mayne to let the Gas Company mind their own business, and he assured the Council they were as anxious to do well for the consumers as Mr. Mayne was. In London the public lamps cost for lighting, &c., from 3s. 9d. to 4s. 5d. each, besides the plant being owned by the Local Authorities. In Dublin the charge was 3s. 8d. per lamp without any charge for plant, upon which the Company had expended thousands of pounds. All these things would come out on arbitration, if the Council demanded it.

After some remarks from Messrs. MULLIGAN and HODGSON, and from Alderman HARRIS, the Standing Orders were suspended, and

Mr. M'EVOY said he was prepared to yield to the objection that the Council had not time to consider the probable consequences of going to arbitration, and he moved instead—"That the letter be referred to the Gas Committee, with special instructions to report on the subject of arbitration, and that in the meantime the Gas Company be requested to continue the public lighting, on the present terms, for three months."

Mr. GRAY seconded the resolution.

Alderman GREGG deprecated anything like an attempt to threaten or coerce the Directors of the Gas Company, who were business men of the highest respectability and integrity.

Mr. MAYNE pointed out that the arbitration clause referred to by Mr. M'Evoy had been repealed by a clause in the Company's Act of 1874, which provided, he said, that they were to have power to increase the price unlimitedly on satisfying an arbitrator that the cost of manufacture had increased, but the consumers could obtain no reduction unless they were prepared to take a worse quality of gas. The only point which he considered the High Sheriff made in favour of the Company was as to the quality of gas in Belfast. They were bound in Belfast to supply gas of exactly the same quality as in Dublin, and, in fact, they never let their gas go below 17 candles, while the average in Dublin was 16 candles. As to the freight from Newcastle to Dublin and Belfast being the same, the Belfast Corporation did not go to Newcastle for their coals, but made their gas out of Wigan coal. Therefore the comparison of Newcastle freights was altogether outside the question; as, if the Dublin Company chose to make their gas from Wigan coal they could do so on the same terms as at Belfast.

Alderman HARRIS: What is the capital of the Belfast Corporation Gas-Works?

Mr. MAYNE: The capital invested in plant at present is £350,000. The area of Belfast is nearly 7000 acres, nearly twice as large as the city of Dublin; and there are 170 miles of mains.

Mr. BROOKS, M.P., said the question they had to consider was whether the Company were getting undue profits. He reminded the Council that the Shareholders of the Company were for many a day without any dividend at all. They were at present making hay while the sun shone—getting a moderate and not unreasonable profit of 10 per cent. on the capital they had invested. To-morrow or next day some process of lighting might be found which would sweep away every vestige of this 10 per cent., capital and all. There appeared, on the face of it, to be some unreasonable charge on the part of the Company, but if the thing were considered with fair regard to the risk of the Shareholders who had invested money in it, it would be apparent to the mind of every man that 10 per cent. was not an unreasonable return for people who sank their money in the manufacture of gas. The Legislature had duly considered this subject. It had been debated before hundreds of Select Committees whether 10 per cent. was a reasonable profit, and nothing less than a complete reversal of the legislation of the last ten years would enable the Corporation to reduce the Company's profits below that figure. What they had to consider was not whether the price of gas was too high or too low, but whether the Company were exceeding their statutory powers, or getting any unreasonable dividend for the risks they ran in the manufacture of gas.

Alderman HARRIS said it was quite true that the Shareholders in the Gas Company did not receive any dividend for a very long time; but he remembered perfectly that at the time some of the present Directors published a pamphlet, in which they showed that it was through the mismanagement and incapacity of the former Directors that no dividend had been paid, and not in consequence of the unprofitable nature of the business in which they were engaged. He quite agreed with Mr. Brooks that, considering the risk, 10 per cent. would be a fair profit; but what the Committee found was this—that, besides the question of the 10 per cent. dividend, the Company were renovating the whole of their works at the expense of the citizens, and putting by a substantial reserve-fund of £35,000 besides. He therefore said they were making much more than 10 per cent., and that if an arbitration took place it would be found that they were making 20 per cent. Public lighting now cost £2000 a year more than it did in 1873 or 1874. At that time they had 20-candle gas, and he remembered well Mr. Cotton proving at the time that, at the price they were then charging, coal being at famine price, they had ample profit to enable them to provide 20-candle gas. Unfortunately, the Corporation had since then lost the services of Mr. Cotton, and the Gas Company had gained them.

Mr. GILL said a vast number of the present Shareholders had not received 10 per cent., nor more than 6 per cent.

The resolution referring the letter to the Gas Committee for report was then agreed to.

A report from the General Purposes Committee, in reference to the pressure at which gas is supplied, next came up for confirmation.

The LORD MAYOR suggested that it should be taken as adopted; but

Alderman HARRIS, Chairman of the Committee, objected to this course. He said that one of the evils in the Council was that when gentlemen took a great deal of trouble with a report it did not meet with the attention it deserved. He therefore moved that it be referred to the Committee to whom the gas question had already been entrusted.

This was seconded and agreed to, and the other business of the Corporation was proceeded with.

At the Meeting of the Municipal Council last Thursday, the following letter, addressed to the Lord Mayor, was read and referred to the Gas Committee:—

Alliance and Consumers Gas Company, Jan. 1, 1880.

My Lord,—My Directors having considered the letter from the Committee nominated to arrange the terms for a new contract for the public lighting of the city, dated Dec. 31, 1879, regret that they are not in a position to reduce the price of gas at present. I am therefore to request your lordship will be so good as to remind the Corporation, at the meeting to be held this day, that the contract between that body and this Company for the public lighting of the city will expire on the 5th of January next, when my Directors, being desirous to meet the views of the Corporation, will be prepared to continue the supply of gas to the public lamps for one year on the terms stated in my letter of the 10th ult.

In the absence of an intimation from the Corporation to the contrary on or before that date, or should the Corporation continue the lighting of the public lamps, my Directors will take same as conclusive evidence that said terms have been accepted for the period named. (Signed) W. F. COTTON.

THE PAYMENT OF BACK DIVIDENDS BY THE CAMBRIDGE GAS COMPANY.

It may be remembered that, at the last half-yearly meeting of the Cambridge University and Town Gaslight Company, on the 31st of July, the report of the Directors—after recommending the usual maximum dividends on the consolidated stock and new shares, and announcing a reduction in the price of gas (from Midsummer) of 3d. per 1000 feet—stated that, "considering the present condition of the Company's affairs, the Directors feel it to be their duty, in the interest of the Shareholders, to recommend a further payment of 10 per cent. on the consolidated stock, on account of the deficiency in dividends in previous years." On the motion for the adoption of the report, an amendment was proposed, "that this meeting does not approve of the part of the report recommending the payment of an additional 10 per cent. on the consolidated stock;" but was lost. It was also suggested by one of the speakers that all action in reference to the matter be suspended until Counsel's opinion on the question, which had been sought by the Improvement Commissioners, had been obtained. The Chairman of the Company (the Rev. Dr. Phelps), however, said that they had been advised by Counsel as to the legality of the transaction; and this view has been upheld by the legal gentleman consulted by the Improvement Commissioners. At their last meeting the Clerk read the questions and replies in the case submitted by the Parliamentary Committee of the Board of Commissioners.

It should be mentioned that the Company obtained an Act of Parliament in 1867 which repealed, with certain provisions, the original Act of the Company—4 Will. IV., c. 24—the special clauses in question being the 32nd and 33rd, which are as follows:—

XXXII.—And be it further enacted, that the said Company, at any general meeting or special general meeting, shall have full power from time to time to call for and examine all or any of the accounts of the said Company; and at every annual general meeting, or some adjournment thereof, a dividend or dividends shall be made out of the interests, profits, and advantages of the undertaking (unless such meeting shall declare otherwise), and such dividend or dividends shall be at and after the rate of such a sum per centum upon or for every share in the said undertaking as such meeting or meetings shall think fit to order and determine, but no dividend shall be made whereby the capital of the said Company shall be reduced, nor shall any dividend be paid in respect of any share or shares after a day appointed for the payment of any call for money in respect thereof by virtue of this Act, until such call shall have been paid.

XXXIII.—Provided always, and be it further enacted, that from and after the twenty-fourth day of June which will be in the year One thousand eight hundred and forty, the said Company of Proprietors shall not be entitled to receive out of the clear profits arising from the said undertaking more than the sum of five pounds per annum upon each share of fifty pounds, in estimating which clear profits no interest on the original capital of thirty thousand pounds advanced in and upon the said undertaking shall be deducted or allowed; and in order to ascertain the amount of the clear profits of the said undertaking, the said Company shall and they are hereby required, from the said twenty-fourth day of June, One thousand eight hundred and forty, to cause a true, exact, and particular account to be kept and annually made up and balanced to the said twenty-fourth day of June in every succeeding year, of the money collected or received by them or for their use by virtue of this Act, and of the charges and expenses attending the supporting, maintaining, and using of the said works; and if the clear profits of the said undertaking shall at any time thereafter amount to a larger sum of money than shall be sufficient to make a distribution among the said Proprietors of five pounds per annum for every such share of fifty pounds, to be computed and take place from the said twenty-fourth day of June, One thousand eight hundred and forty, then and in such case the excess or surplus which shall be more than sufficient for the purposes aforesaid shall from time to time be placed in the hands of such person or persons, or on such Government or other security or securities, to answer any deficiencies that may happen in the next or any succeeding year or years, as the said Company shall for that purpose order or direct, until such excess or surplus shall amount to the sum of three thousand pounds; and the interest or dividends of such sum or sums so to be invested shall be paid and applied in like manner as the moneys to be received by or for the use of the said Company by virtue of this Act are to be paid or applied; and the total amount of every such annual account as aforesaid, certified in writing as just and true, under the hand of the Chairman for the time being of the Committee of Management, or their Superintendent, or any other officer of the said Company, together with an account of the dividends and interest to be from time to time received on all such moneys so to be placed out as aforesaid, shall within fourteen days next after the making up of every such annual account so to be made up as aforesaid, be laid before the Vice-Chancellor of the said University of Cambridge, the Mayor of the town of Cambridge, and three of the Commissioners acting in execution of the hereinbefore recited Acts of the twenty-eighth and thirty-fourth years of the reign of his said late Majesty King George the Third (not being either of them personally interested in the said undertaking), and one at least of such three Commissioners being a University Commissioner (which said three Commissioners shall be nominated and appointed at any of the general meetings of the Commissioners under the said recited Acts), and for the authentication of which account the said Company shall (if required) produce all their books, bills, receipts, vouchers, papers, and writings to the said Vice-Chancellor, Mayor, and said Commissioners, and if it shall appear from the accounts to be respectively made up on and from the said twenty-fourth day of June, One thousand eight hundred and forty-three, that the clear profits of the said undertaking, after such sum shall have been so invested, including the said dividend and interest, shall, upon an average of three years then next preceding, have exceeded the rate of five pounds per annum upon every such share of fifty pounds, then and in every such case the said Company of Proprietors shall pay such surplus of the said clear profits, dividends, and interest to the said Commissioners for paving, cleansing, and lighting the said town of Cambridge, or their Treasurer, to be by them applied and disposed of towards and in aid of any rate or assessment, rates or assessments, made or to be made under the said Acts, anything in this Act to the contrary notwithstanding; and if the said Company shall

refuse or wilfully neglect to deliver or to lay before the said Vice-Chancellor, Mayor, and said Commissioners, or any one of them on behalf of the others of them, the said accounts, or other books, bills, receipts, vouchers, papers, and writings hereinbefore mentioned, for the space of seven days after being required so to do in writing by the said Vice-Chancellor, Mayor, and said Commissioners, or any three of them, the said Company shall forfeit and pay the sum of fifty pounds for every such refusal or wilful neglect, and the further sum of five pounds for every day such refusal or wilful neglect shall continue after the expiration of the said seven days; such respective penalties to be recovered by any person who may sue for the same, with full costs of suit, by action of debt, or on the case, in any of His Majesty's Courts of Record at Westminster.

The four questions addressed to Counsel, and his replies thereto, were as follows:—

Question 1.—Whether, by the new Act of the Company, sections 32 and 33 of their original Act are repealed.

Opinion.—The new Act of the Company repeals the old one, except so far as its express provisions operate to prevent the repeal. There is no express provision saving any rights of the Commissioners. I am of opinion, therefore, that section 33, so far as it gives any right to the Commissioners, is repealed. On the other hand, section 25 of the new Act limits the amount of dividend that may be made by the Company in any year only by providing that it shall not be larger or other than the Company might have made if the old Act had not been repealed. This provision keeps alive the limitation contained in section 33 of the old Act, which, in my opinion, so far as it imposes a limitation, is not repealed. I am of opinion, however, that the only limitation in section 33 of the old Act is in effect that the Company shall not receive out of profits more than 10 per cent. on the capital authorized by the old Act, and that the 10 per cent. is to be reckoned from June 24, 1840, so that no limitation is in force until the dividends declared on the old capital amount together to 10 per cent. from June, 1840, on the £30,000 original capital, and a like percentage on the additional capital created under the old Act from the time of its becoming entitled to receive dividends. I am of opinion that section 32 of the original Act is repealed, but that its repeal does not affect any question before me.

Question 2.—If Counsel should be of opinion that sections 32 and 33 of the original Act are not repealed, he will please advise whether the Company have any power to pay dividends or bonuses on capital raised previous to the passing of the new Act, and whether all profits realized above £10 per cent. per annum ought not to be handed over to the Commissioners under the original Act.

Opinion.—I am of opinion that the Company have power to make dividends or bonuses on capital raised previously to the passing of the new Act until all deficiencies in dividends already declared by which such dividends fall short of 10 per cent. are made up.

Question 3.—If the Commissioners are entitled to surplus after payment of 10 per cent., what proceedings should be taken to recover the same?

Opinion.—I am of opinion that the Commissioners have no right in any event to surplus profits, the provisions of the Gas-Works Clauses Act, 1847, and the special provisions contained in section 71 (as to maximum charge) and in section 83 (as to transmitting accounts) being substituted for the corresponding provisions of the old Act.

Question 4.—If the Commissioners are not entitled to the whole surplus, are they or the gas ratepayers entitled to an account of the profits made on the new and old capital respectively, so as to distinguish and exclude the profits earned by the new capital and to give the right to require that after the prescribed dividend of 7 per cent., under section 25 of the new Act, is provided for, the surplus profits on that part of the capital shall be dealt with in accordance with clauses 31 to 35 of the Gas-Works Clauses Act, 1847, directing investment for a guarantee-fund and ultimate reduction of the price of gas.

Reply.—Neither of the Commissioners nor the ratepayers are, in my opinion, entitled to have any distinction made between profits earned by new capital and those earned by the old capital. The whole profits of the Company are to be dealt with and accounted for as prescribed by the Gas-Works Clauses Act, 7 per cent. being the prescribed rate on new capital within the meaning of the Act, and 10 per cent., including arrears, on old capital, standing for the prescribed rate as to the old capital, and the gas ratepayers (but not the Commissioners) are entitled to such remedies as are given by section 35 of the Gas-Works Clauses Act, and to no others.

11, *New Square, Lincoln's Inn.* (Signed) John Rigby.

THE GENERAL GAS LIGHTING AND HEATING COMPANY OF BRUSSELS.

The Annual General Meeting of this Company was held in Brussels on Dec. 20, 1879, when the Board of Direction presented their report on the operations of the Company, together with statements of account, for the twelve months ending Aug. 31. The report stated that the year had been marked by one very important feature for the Company—namely, the sale of their two stations at Chemnitz, in Saxony, the contract for the lighting of which town was originally to terminate in May, 1884. For some time past the Company had been in negotiation with the Municipality, with the view either of obtaining a renewal of the contract or of disposing of their works, the latter alternative being at length the only one under discussion, as the Municipality had resolved to undertake themselves the public and private lighting of the town. The Company's offer to sell having been accepted, the works were handed over to the Authorities as and from the 1st of July last, for the sum of 2,833,600 frs., or £113,344, that being the amount agreed upon after considerable negotiation. In this sum was included the value of the concession for the lighting of Schlosschemnitz. The value of the Chemnitz works on July 1 last being estimated at 3,470,000 frs., or £138,800, there was consequent upon this sale a difference of 694,767 frs., or £27,790, in the item of "General expenses of first establishment." This amount had, therefore, been deducted from the sinking-fund. One satisfactory result of the transaction was to considerably alter the financial position of the Company. From and after July 1, 1879, the Municipality were to pay every half year, on the 1st of January and the 1st of July, 5 per cent. per annum interest on the sale price of the works, one instalment of which, to the amount of £15,000, was payable on Dec. 31, 1879; the balance not to be handed over until six months notice had been given by either party, such privilege to date from Jan. 1, 1880, in the case of the Municipality, and from July 1, 1880, in the case of the Company. In payment of the purchase-money the Company had received five bonds, one of which was payable on Dec. 31, 1879, and the other four on the conditions above mentioned. The Directors, therefore, had in hand the funds necessary for carrying out whatever extensions might be called for by the improvement of their business for many years to come.

The better financial position of the Company had enabled them still further to reduce their bond debt, which stood at 11,260,000 frs., or £450,400, as against 11,677,500 frs., or £467,100, at the corresponding period of the previous year. This had been effected by paying off 999 bonds, of which 164 were re-issued previous to the sale of the Chemnitz works.

The net profit produced by the working at the several stations of the Company during the year had increased by the very substantial sum of 1,996,852 frs., or £79,873, being an advance of 82,564 frs., or about £3300, on the profit of the preceding year, although the former sum was, of course, *minus* the profit that would have been made at the Chemnitz works in the months of July and August. This increase, which was principally the result of better working consequent upon the improvements and extensions carried out at the several stations, was very much more satisfactory, inasmuch as something like 150,000 frs., or £6000, of the profits had been expended on maintenance of works during the year. To the sinking-fund had been added the sum of 500,000 frs., or £20,000, which the Directors believed would be amply sufficient to represent the depreciation in the value of the Company's plant and buildings, and the shortened period of their concessions.

With regard to the effect of the sale of the Chemnitz works on the profits of next year, the Directors hoped that by the abolition of certain expenses, together with the interest on the amount realized by the sale and the improved revenue that would in all probability be earned at their other stations, which had every year shown progress, no sensible diminution would be felt.

There had been little to report in the way of outlay on works of first establishment during the year. The work done had consisted principally of extensions of mains at the several stations, the replacement of inadequate apparatus at St. Omer, and the completion of the works at Tournai, which had been in operation since August. The original works had been pulled down, and the old materials sold or utilized. The total outlay on works of first establishment had been 637,661 frs., or £25,506, in which was included the balance of the purchase-money of the land required for new works to be erected next year at Prague, and the gross sum had been apportioned as follows:—

	Francs.	Sterling.
Land	103,352	£4,134
Buildings	104,622	4,185
Plant and machinery	203,776	8,151
Mains	225,911	9,036
Total	637,661	£25,506

There had been but a slight increase in the sale of gas, owing to the long-continued stagnation in trade. The profits had, nevertheless, tended upwards. The Company had sold 18,267,043 cubic mètres, or about 644¾ million cubic feet, against 17,943,668 cubic mètres, or 633½ million cubic feet in the year 1877-8; but as the former figure did not include the sale of gas for July and August, 1879, at the Chemnitz works, it would be necessary, in order to make a just comparison of the two years, to deduct from the latter figure the quantity of gas sold in those months of 1878, thus bringing it down to 17,756,790 cubic mètres, or 636 million cubic feet, which would then show an increase of 510,253 cubic mètres, or 2·87 per cent., in the consumption.

On the 31st of August, 1879, the total number of public lamps supplied was 212,855, against 205,856 on Aug. 31, 1878, being an increase of 6999 lamps. The average consumption of each burner was 87·29 cubic mètres, or 3078·30 cubic feet, against 87·16 cubic mètres, or 3076·75 cubic feet in 1877-8.

The length of mains laid on the 31st of August, 1879, was 648,497 mètres, or 709,024 yards, against 625,366 mètres, or 683,735 yards, on the corresponding day in 1878.

For every 100 kilos. of coal carbonized, 28·45 cubic mètres of gas were obtained, being at the rate of, as nearly as possible, 10,000 cubic feet to the ton; of coke, 65·10 kilos., or about 18 bushels to the ton; of tar, 4·67 kilos., or about 10 gallons to the ton; of ammoniacal liquor, 10·5 litres, or about 23 gallons to the ton, of the strength of 2·5° Twaddel. These returns had for several years shown constant improvement, as evidenced by the fact that, although the Company carbonized about 1300 tons of coal less in 1878-9 than in the preceding year, 510,000 cubic mètres, or about 18 million cubic feet more gas had been sold.

In reference to the price of coal there had been nothing to call for remark, the contracts for the supply of this material having been previously made for two years.

The sale of coke continued to be satisfactory, and the Directors had succeeded in contracting for the disposal of the large stock on hand at Charleroi. At none of the stations was there any great quantity of this residual in store. The original contracts for the tar and ammoniacal liquor were still in force.

The general operations of the Company during the year having been disposed of, the report proceeded to deal with the several items in the accounts. These, however, do not call for special notice, with the exception, perhaps, of the item "Plant, materials, tools, &c.," on which 1,042,250 frs., or £41,690, had been expended. This sum was apportioned as follows:—

	Francs.	Sterling.
Working plant	572,129	£22,885
Meters, &c., on hire	224,588	8,984
Coal	125,081	5,003
Residual products	85,490	3,420
Material	34,962	1,398
Total	1,042,250	£41,690

These figures show a considerable diminution on the amount of this item in the previous year's balance-sheet, owing in part to the sale of the Chemnitz works. On the other side of the account, the reserve-fund had been increased by 656,102 frs., or £26,244, and the sinking-fund reduced by 694,768 frs., or £27,790, the amount lost by the Chemnitz transaction, and the whole of which had been written off; at the same time the item had been increased by 500,000 frs., or £20,000, taken from the profits of the year's working. The item "Sundry creditors," consisted of the amounts owing to the Company's bankers, and other persons together with the sums deposited with the Directors as securities by the principal officers.

The profit and loss account showed a profit of 1,996,853 frs., or £79,874, as against 1,914,288 frs., or £76,572, in the preceding year; to which was to be added the interest due from the Municipality of Chemnitz for the two months of July and August, and the balance brought forward from last account, thus bringing the total up to 2,024,034 frs., or £80,961. When from this were deducted the general expenses, the difference in the issue and redemption prices of the bonds, the bankers commission, the amount placed to the sinking-fund, and the statutory 4 per cent. added to the reserve, there remained the sum of 761,486 frs., which had been thus disposed of:—

	Francs.	Sterling.
First dividend of 25 frs. per share	583,875	£23,355
15 per cent. on balance, added to reserve	26,116	1,045
12 per cent. on ditto, allocated among chief officers	20,892	835
Second dividend of 5 frs. per share (making 6 per cent.)	116,775	4,671
Total	747,658	£29,906

leaving a net balance of 13,828 frs., or £553, to be carried forward.

The Directors report was, as usual, accompanied by that of the Board

of Supervision, who signified their approval of the dividends recommended, and testified to the accuracy of the accounts presented, which were as follows:—

Dr.—*Statement of Assets and Liabilities, Aug.* 31, 1879.

	Francs.		Sterling.
To Share capital (23,355 shares)	11,677,500	..	£467,100
Bond ditto (11,200,000 frs.), viz.—			
4316 A bonds (1867)	2,158,000	..	86,320
7208 B ,, (1868)	3,604,000	..	144,160
7081 C ,, (1874)	3,540,500	..	141,620
40 D ,, (1876)	200,000	..	8,000
3515 E ,, (1876)	1,757,500	..	70,300
Reserve-fund	713,970	..	28,559
Sinking-fund 2,269,943 frs.			
Deduct loss on sale of Chemnitz works 694,768 ,,			
1,575,175 frs.			
Add year's proportion of revenue, as per profit and loss account 500,000 ,,			
	2,075,175	..	83,007
Unpaid share coupons	5,023	..	201
Unpaid bond ditto	232,850	..	9,314
Balance due on Anderlach works	177,297	..	7,092
Sundry creditors	478,751	..	19,150
Security deposited by chief officers	370,000	..	14,800
Bills payable	209,396	..	8,376
Dividends = 30 frs. per share	700,650	..	28,026
Carried to profit and loss account	13,828	..	553
	27,914,440		£1,116,578

Cr.—*Statement of Assets and Liabilities.*

	Francs.		Sterling.
By General expenses of first establishment	21,620,519	..	£984,821
Extensions of works and mains	637,661	..	25,506
	25,258,180		£1,010,327
Deduct first cost of works at Chemnitz	3,470,090	..	138,804
	21,788,090		£871,523
Sundry debtors	589,421	..	23,337
Works at Chemnitz taken by Municipality	2,857,272	..	114,291
Caution-money deposited at Rimini and Sienne	39,716	..	1,589
Difference between the issue and redemption prices of bonds	1,075,391	..	43,016
General benefit and relief funds	80,037	..	3,202
Bills receivable	43,752	..	1,750
Miscellaneous funds, including officers securities	404,511	..	16,180
Plant, materials, tools, &c.	1,042,250	..	41,690
	29,914,440		£1,116,578

Dr.—*Profit and Loss Account, Aug.* 31, 1879.

	Francs.		Sterling.
To General expenses	91,918	..	£3,677
Bond coupons, and difference between the issue and redemption prices	614,458	..	24,578
Bankers commission and interest, &c.	29,717	..	1,189
Sinking-fund on works of first establishment	500,000	..	20,000
Dividends = 30 frs. per share	700,650	..	28,026
Added to reserve-fund	52,571	..	2,103
Share of profits allowed to chief officers	20,892	..	835
Balance carried forward	13,828	..	553
	2,024,034		£80,961

Cr.—*Profit and Loss Account.*

	Francs.		Sterling.
By Balance on Sept. 1, 1878	3,509	..	£140
Profit on the year's working at the several stations of the Company	1,996,853	..	79,874
Interest due from the Municipality of Chemnitz, July and Aug., 1879.	23,672	..	947
	2,024,034		£80,961

DERBY GAS COMPANY.

An Extraordinary General Meeting of this Company was held on Monday, the 22nd ult.—Mr. GASCOYNE in the chair—for the purpose of passing a resolution for the raising of further capital under the powers of the Derby Gas Act, 1876, to be expended on the enlargement of works.

The CHAIRMAN said the resolution he proposed to move was simply in furtherance of the decision already arrived at by the Shareholders at a former meeting. In consequence of the necessity of enlarging their works, the Shareholders decided to ask for, and had accepted tenders. The contracts were proceeding somewhat rapidly, and were only delayed for the time by the weather. The works, however, must go on with great rapidity, for in accordance with the terms of the contract they must be completed by Christmas next year. They must be prepared, therefore, from time to time, to pay, and instalments had to be paid every six weeks, so that they would have to raise the money in a tolerably short time. The resolution he had to propose was as follows:—

Resolved, that the sum of £70,000, in addition to the present capital of the Company, be now raised under the powers of the Derby Gas Act of 1876, by the creation and issue of 5600 new ordinary shares of £12 10s. each, and that the sum be apportioned amongst the present holders of the ordinary shares of the Company respectively, in the proportion of one new to one existing share, and be offered to them at par; and that the dividend on the additional share capital to be thus raised be paid at a rate not exceeding 7 per cent., in respect of every £100 of such actually paid up as shall be declared at each half-yearly meeting of the Company.

He might state that the Shareholders passed a resolution to extend the works, and they had now to arrive at a resolution to pay. The Shareholders had very properly committed themselves to the new works; if they had not done so, and the town had been short of gas, they would have been compelled to do so by the Town Council. Their own interest dictated that they should take the step they had done. For 60 years they had had nothing but prosperity, and had paid full statutory dividends, and they were certainly in as good a position now as at any time previously. When this step was taken, there would be ample resources to meet the dividends. Should the electric light ever come into general use, their property would still remain valuable. Had they been present at Nottingham during the recent exhibition of gas appliances there, they would have seen what a grand adaptation could be made of gas for heating and cooking purposes. The shares had been selling for more since the electric light scare than they had ever done before, which showed the confidence the public had in the performance of gas. He (the Chairman) therefore hoped the Directors would have the continued confidence of the Shareholders. Speaking for the other Directors, and not for himself, he was bound to say they were the most attentive Board in England. They were also surrounded by Officers of great ability, and the Shareholders had every reason to be satisfied with their future prospects.

Mr. RICHARDSON seconded the resolution.

In reply to a question, the CHAIRMAN explained that the existing number of shares was 5600, and the same number of new shares would be allotted, so that each existing Shareholder would be able to take a similar number of shares to that he at present held, if he chose.

Mr. SHEFFIELD asked what was the amount of the contracts for the new works.

The CHAIRMAN replied that they might expect the cost to reach £48,000 or £50,000.

After some further remarks, the resolution was passed unanimously, and the meeting terminated.

BEYROUT WATER-WORKS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the London Offices on Friday, the 19th ult.—E. EASTON, Esq., in the chair.

The SECRETARY (Mr. Robert M. Young) having read the notice convening the meeting, the following report was presented:—

The Directors herewith submit, for the information of the Shareholders, their sixth annual statement of accounts to the 30th of September last, duly audited.

On the night of the 25th of December last an extraordinary flood occurred, causing the Dog River to rise upwards of 20 feet above its ordinary level. This flood carried away the iron aqueduct (113 feet in length) conveying the Company's water across the river, and caused the destruction and disappearance of a mill of 200 years standing, and very serious damage to the Company's weir and other works. The immediate consequence was that the supply to the town of Beyrout was stopped for upwards of six weeks, and, in the meantime, all revenue lost.

The greatest credit is due to Mr. Cornish, the Company's Engineer, for the efficient and expeditious manner in which the accident was met. Nevertheless, although the works were thus repaired so as to admit of supply to the town, the accident has necessitated a considerable outlay during the whole of the year.

The Directors are led to hope that the present aqueduct, although built of timber, will, with proper precautions, fully answer the purposes required.

They are able to report that the number of contracts for supply of water has increased in a larger ratio than during any corresponding period of former years, and they are advised that the prospects for the future are encouraging.

They regret to state that since the last meeting the Board has suffered the loss of Mr. J. T. Carbonell, by his decease, and of Messrs. W. P. Andrew and A. W. Young, by their resignations. The Shareholders will be asked to appoint new Directors to fill up these vacancies.

Messrs. Moore and Wallis offer themselves for re-election as Auditors of the Company.

The Directors also recommend that Mr. Charles Watkins be re-appointed Auditor of the local accounts at Beyrout for the current year.

ENGINEER'S REPORT.

Beyrout, Nov. 18, 1879.

The audited accounts and balance-sheet for the financial year ending the 30th of September last, and which were forwarded to you on the 4th inst., are, I trust, sufficiently clear in giving you all the necessary information as far as accounts are concerned.

During the year the number of private subscribers has increased 162, of which 142 are new services, and the remainder services which were previously shut off and again renewed. The amount received for surplus water taken by meter has also been much in excess of that of last year, it being 61,735 piastres, against 46,133 piastres during the previous year. As 120 of the new services were put on during the last five months of the financial year ending the 30th of September last, they naturally have not increased the revenue account as much as they will during the succeeding one.

In consequence of the Municipality having lately caused a number of new roads to be opened out, and the desire of many of the inhabitants to take water provided the Company's pipes pass a public square into their houses, I have utilized the old stock of 3 and 2-inch pipes which were lying in our stores, as well as others which you sent out, in extending several of the mains. I am glad to state that the success has been what I anticipated, and that the prospects for the forthcoming year are good. The 1100 pipes which you last sent out are still in stock, and will be laid down during the winter months in such streets where the demand for water is likely to be remunerative. The expense to the Company will be little more than the cost of the pipes, as the work will all be done by our own regular workmen during the slack season.

Besides opening up new roads, the Municipality is now engaged in improving the drainage system in many parts of the town. They are also transforming a public square into a public garden, and are doing their utmost to make arrangements for watering the streets during the summer months; all of which tend to increase the Company's revenue.

The flood which caused the serious accident to the Company's works at the Dog River during last December was without precedent, and has unfortunately cost the Company about £800 to do the necessary repairs, and has caused a loss of revenue of about £600, which are large items to the debit of profit and loss account. The works at the present time are in perfect order, and every precaution has been taken to prevent accidents during the forthcoming winter.

Notwithstanding the several changes in the position of the Company's *employés*, and the necessity of increasing the staff for special duties, the expense is less by £20 than last year.

Nothing has as yet been settled either as regards railway communication with the interior, or a harbour for Beyrout. His Highness Midhat Pacha has certainly done his utmost to carry out these projects, but without support at Constantinople he is utterly powerless. Although repeated assurances have been expressed by the Sublime Porte that his Highness has full powers to carry out reforms, it is evident to all sensible Europeans resident in the country that his powers have been so much curtailed as to cause him to be looked upon as only a nominal Governor-General. The visit of Her Majesty's Ambassador to Syria has, however, considerably raised the hopes of the inhabitants that something is at last to be done for the country.

Before closing this short report, I must mention that not only are many of the old systems of public water supply to the town destroyed through neglect, but that many of the inhabitants have allowed their wells and cisterns to become useless. Taking these and several other matters into consideration, I most confidently predict that the Company's prospects must rapidly improve. (Signed) JAMES NIXON, Manager.

The CHAIRMAN, in moving the adoption of the report, said he had first to express his extreme regret that he occupied the position he did. Since the Company's last meeting, the Directors had lost by death one of their colleagues—a gentleman who was a Director of one of the London Water Companies, and whose great knowledge of matters of this nature was of essential service to them. He referred to Mr. J. T. Carbonell. They had also to regret the loss, by his resignation, of a gentleman who addressed the Shareholders on the occasion of their last meeting—Mr. W. P. Andrew—who was of the greatest use to his colleagues in all matters requiring sound judgment and careful consideration, and who also explained at these meetings the views of the Board in a manner which was characterized with exceptional clearness. They had further lost the services of Mr. A. W. Young, M.P., who was a most indefatigable Director, but who resigned on being appointed to a seat at the Board of the South-Eastern Railway Company. The consequence was that he (the Chairman) and Mr. Staniforth found themselves alone but the Shareholders would be asked to alter this state of things, and to reconstruct the Board so that the Company might be worked more satisfactorily. Being thus left alone, his colleague and he had tried to do the best they could in the Shareholders interests in the past year, although the prospects at the commencement of it were by no means encouraging to any one, and the effort had been one requiring no small amount of courage. He was, however, glad to say that they did at last see some glimmer of hope on their, he must call it, rather unfortunate Company. On previous occasions the Shareholders had been informed of some of the reasons why the Company had not been so successful as it ought to have been, those reasons chiefly proceeding from local causes; but at last he thought they looked as if they were going to be removed. The report of Mr. Nixon was encouraging—to him especially, as a water-works Engineer, and as having had a good deal of experience in these matters—when he stated that there were so many new subscribers, and especially when he said that the majority of those subscribers had come in within the limited period of five months. The unfortunate accident of last year, which was mentioned in the report, had, of course, thrown the Company back very much. This, however, had now been

remedied, and, as far as could be seen, the works were likely to be as efficient as they were before the mishap. He had also to mention that a certain amount of alteration had been made in the management of the Company in Beyrout. Mr. Cornish, who had been the Company's Engineer out there, and had acted with so much ability, had been offered and had accepted the appointment of Manager of the Alexandria water-works; but they had concluded an arrangement, on very favourable terms, with this gentleman, by which his services would not be altogether lost to the Company so long as they were required; and he (the Chairman) was happy to say that the result of nine or ten months working in Beyrout showed that Mr. Nixon's very efficient management, with the assistance they had arranged for from Mr. Cornish, was carrying on the affairs of the Company quite as well as before, and this was done at less cost. He thought they had reduced the expense of working to the extreme minimum in both places, and now they could only wait for the development of the works, and this at last seemed about to take place. Another letter had been received from Mr. Nixon, later than that of the 18th of November, which showed that they could, by exercising a certain amount of discretion, probably increase the revenue of the Company by allowing the water to be taken at a reduced rate for the irrigation of gardens. There was a large amount of surplus water available, and if the Directors could do what was suggested—dispose of it at even a very small rate—they would do so; anything to increase the revenue of the Company. As far as he could see, the Company would be able next half year to pay as much as they had at last succeeded in paying on their bonds, and perhaps they might do a little more; but the half of the next coupon he thought the Directors could perfectly clearly see their way to. To fill up the vacancies on the Board, and to put them in the condition really of a working Board, they had, after careful consideration and talking about the matter to a number of the Shareholders, come to the following resolution—viz., to ask the Shareholders to appoint the gentlemen he would name. The first was Mr. John Morris, whose name, he need not say, would carry much weight in the City of London, and whose great ability would make it certain that they would have the very best advice whenever they required it. Moreover, that gentleman represented probably the largest section of the Shareholders. Mr. William Western, who was present, was one of the Auditors of the Company, but he (the Chairman) had persuaded that gentleman to retire from the auditorship, and give the Company his services as a Director. That, he might point out, would save them 26 guineas a year; and Mr. Western's knowledge of all the details of the accounts would make him an extremely valuable member of the Board. The third gentleman they proposed was Mr. Young, who was the Secretary, and the reason for doing so was not only because Mr. Young had, through evil and good report, stuck to the business in a manner which showed he had the true British pluck, but also because he would be on the spot. Unfortunately, the quorum of Directors was settled at four, and they could not by a resolution of the Company alter it, as it was one of the conditions approved by the Turkish Government, and an alteration, as the Directors were advised, was impossible. Mr. Staniforth, Mr. Morris, and himself were very much engaged, and could not be sure of being present, and by making this appointment they would have Mr. Young on the spot, and that gentleman probably knew more about the Company than any one else. The Directors would, therefore, for the reasons he had stated, ask the Shareholders to make these appointments.

Mr. J. Staniforth seconded the motion.

Mr. Sanville asked whether the question of supplying water at a cheaper rate was not mooted three or four years ago.

The Chairman replied in the affirmative, and said perhaps he ought to have stated so in referring to the subject. However, there was never any application for it. He remembered the circumstances perfectly well, but there had never been till now any movement in the direction intimated.

Mr. Sanville inquired whether Mr. Nixon anticipated a large number of these applications for water.

The Chairman said he did. He read the letter referred to of Mr. Nixon, who, in conclusion, said he was of opinion that in two or three years the Company would be able to dispose of the whole of their surplus water, very much to their benefit. The price suggested for the water was 5 centimes per cubic mètre, and the opinion was expressed that when once the water was utilized in the manner stated, those who employed it would see so many advantages follow that they would not care to be without it.

Mr. Staniforth, in reply to a question, said the whole of the present revenue came from private consumers and for the supply to the public fountains. The 120 new services put on during the last five months, as stated by Mr. Nixon, had not come into the present accounts, which were made up to the 30th of September. They would come into the next accounts.

The Secretary, in answer to a Shareholder, said the new services would average £4 each—perhaps £5—but they were increasing.

Mr. Sanville asked what Midhat Pacha had done for the benefit of the Company. At the last meeting Mr. Andrew stated that he was in correspondence with Midhat Pacha, and he hoped to be able to induce the people to take the water.

The Chairman said he did not suppose Midhat Pacha had been more successful in that reform than in some of the others he had attempted to introduce.

The motion was then put, and carried unanimously.

Mr. Sanville moved, and Colonel Evelegh seconded, the appointment as Directors of Messrs. John Morris, R. M. Young, and W. T. Western.

The Chairman said it was right to point out that Mr. Young would practically continue to perform the duties of Secretary, as well as those of a Director, and it was proposed that his present salary be continued.

The motion was unanimously agreed to.

Mr. Macnille moved, and Mr. Staniforth seconded, the re-election as Auditors of Messrs. Moore and Wallis, and the motion was carried unanimously, as was likewise that relating to the re-election as local Auditor of Mr. Charles Watkins.

Mr. Western said that when he was asked to join the Board, instead of being one of the Auditors, he pointed out that the Directors had much better obtain the services of a gentleman who had some local knowledge, as he had never been to Beyrout. However, there seemed no one who had such knowledge, and, therefore, he had consented to join the Board. If, however, they could find any one to join them who had some knowledge of the place—and this was what was wanted—and who would suit them better than himself, his place was quite at their disposal.

On the motion of Mr. Sanville, seconded by Colonel Evelegh, a vote of thanks was unanimously accorded to the Chairman and Mr. Staniforth for the trouble they had taken in connection with the Company's affairs.

The Chairman expressed the thanks of his colleague and himself for the confidence shown in them. It had not, he said, been a very pleasant business to face what they had had to face in the last year or two, but he hoped the Shareholders would give them credit for having stuck to the ship. They would continue to do so, and with the colleagues who had just been given them he thought they would do as well as they could under the circumstances.

The proceedings then terminated.

DINNER TO THE WORKMEN AT THE TUNBRIDGE WELLS NEW GAS-WORKS.

Last Thursday, at the invitation of Mr. R. P. Spice, the Engineer of the Tunbridge Wells Gas Company, the opening of whose new works we recorded a few weeks since, the workmen employed, numbering more than a hundred, and some others, assembled in the meter-proving and experiment room, and partook of a substantial dinner of beef and pudding, after which tobacco and spirits were put upon the tables, ample justice being done to the whole of the provision. Mr. Spice took the chair, and was supported by Mr. John Read and Mr. George Scott, the Secretary and Manager respectively of the Company.

The first toast drunk was "Success to the Tunbridge Wells Gas Company," after which Mr. Spice proposed "The Health of the Workmen," to whom he wished continued good luck and a happy new year. The day was, he said, the first day of the new year, and it happened to be his birthday. He had refused several invitations from personal friends to spend the day, as was his wont, with them, in order that he might spend it with the men connected with the Tunbridge Wells Gas-Works. He had had very much pleasure that afternoon in handing the new works over to Mr. Scott, who would now have the responsibility of conducting a truly modern establishment. If Mr. Scott, with all his northern acuteness, could not make a good job of the works, he did not know who could. He was quite sure Mr. Scott would have the support of the workmen, for whom every accommodation for their comfort and convenience had been provided. They would now have access to a spacious dining-room, lavatories, hot and cold baths, and a retort-house in which they would have ample room, and avoid being cooked, as they too often were in old-fashioned works. The men had the Company to thank for these things, for they readily approved of the plan showing such arrangements.

One of the men, known as Tom Skinner, was called upon to respond, and he did so with a speech and a laughable song.

Mr. Spice next proposed the health of Mr. Scott, who, he said, he knew stood well in the estimation of the men, and he was sure the toast would be received with the greatest enthusiasm.

The toast was drunk with musical honours, and

Mr. Scott replied that he was very pleased to find such a genial and cordial feeling amongst the men. This had existed ever since he had been amongst them, and he hoped would continue. He believed in a "sweet reasonableness," and that men should feel a responsibility in their work. He had endeavoured to inculcate these principles at the old works, and should enforce them in the new ones, for here he considered he had a great interest at stake. He believed that work done heartily was done in the easiest manner. The men might rely upon his doing whatever he could for their comfort, and in so acting he knew he should be looking to the interest of the Company and all concerned.

Mr. Read next proposed the health of Mr. Spice, the founder of the feast, and the designer of their beautiful gas-works. He said he was sure all would agree with him that a vast amount of pains, a great amount of thought, and an extreme amount of diligence had been exercised by Mr. Spice in achieving such happy results. Mr. Spice had been before the world for a very long time, and no one could point to anything he had done of which he need be ashamed.

The toast having also been drunk with musical honours,

Mr. Spice, in reply, said with regard to this undertaking he could assure his hearers he had not been lying on any bed of roses for some time past, for very grave difficulties, involving a great amount of anxiety, had had to be overcome. He thought all might now look forward to a satisfactory state of things so far as the interests of the Tunbridge Wells Gas Company and their consumers were concerned. It might be some little time before they would be able to supply gas from their works as cheaply as they should like to do, simply because so much money had necessarily been expended, for which a return could not be immediately realized. It was not their fault that they had spent so much money; he did not think it was anybody's fault. Engineers had to deal with circumstances, as well as to adapt themselves to those circumstances. In this case it so happened that the Company had been compelled to go to Parliament three times, and obtain two Acts, before they could get a footing and a site to build upon. There were differences of opinion among the townspeople as to the first site selected, and the erection of the works upon that site would have been a saving to the Company of £20,000. This sum had been expended in maturing the present works, which would have been saved on the other site, and it was a misfortune for which the Company were in no way responsible. They had been driven to the present site, and it would only be by the most extreme economy of manufacture that satisfactory results could be achieved. That economy would not be brought about by cheeseparing, and imposing extra labour upon the workmen; on the contrary, the labour would be more easily performed, through the introduction of West's plan of drawing and charging retorts, than under what was now called the old system. This was the age of progress, and they would yet have a superior order of things to that which existed in the present day. Let them remember also that they had minds as well as bodies to be taken care of. Having that in view, he had endeavoured to contribute to their stock of knowledge by forming the nucleus of a library at the works. He had brought from his book-shelves in Parliament Street a small selection of works, and he hoped others would contribute to the stock, till by-and-by they would have a library which might favourably compare with any ordinary library in Tunbridge Wells. These books would be placed in the dining-room. Those he had brought included: "The Workshop Companion," "History of the Plague and Fire of London," "Curiosities of Civilization," "The Text-Book of Science," four volumes of the "Leisure Hour," fourteen volumes of "Waverley Novels," "Year-Book of Facts," "British Manufacturing Industries," "Walker's Dictionary," &c. He should add to the list, works by Hugh Miller, Smiles, and other authors of a similar character. He should not be at all surprised if some of them were to become literary men in the course of time. He could not imagine a better field for the exercise of intellect and intellectual pursuits and entertainment than a gas-works. To his mind a gas-works was a paradise for a man who thought, and a man was there bound to think if he only observed that which was going on about him. No man should seek to be lifted from the sphere for which he was fitted, but men should fit themselves for better things to-morrow than they were fitted for to-day. Every man who was the father of a family should aim to become a model father, and every son should aim to become a better man than his father, so to speak; his aim should always be upwards and onwards. In conclusion, he proposed the health of Mr. Read, of whom he said that he knew no one among his circle of friends—and it was a rather extensive one—for whom he had a greater respect. Mr. Read was the exponent, the mouthpiece of the Directors, the controlling power of the undertaking, a man admirably gifted for the duties which he had to discharge. Mr. Read stood between the consumers and the Directors, and discharged his duties with marked fidelity, zeal, and success.

The toast was received with enthusiastic cheering.

Mr. Read, in responding, said he had been a servant of the Tunbridge Wells Gas Company for upwards of a quarter of a century, and he saw present the oldest servant of the Company. When he first entered upon the service

of the Company he found that honoured and respected old man (Moon) in their service, and he most assuredly should be wanting in his duty did he not pay some respect to that man's service. Good servants made good masters, and if Moon had not conducted himself well, he would not be in his present position. He was also quite certain that if the Company had not behaved properly to him, he would have severed his connection long ago. He (Mr. Read) was always anxious to do his duty to the Company, and he was equally desirous that the consumers should have his strongest interests. At the same time, he did not think the men could accuse him of extracting the largest amount of work out of them with any harsh feelings. Of course there were, and would be, times when things would not run so smoothly as one could wish; but then, instead of sitting down with folded hands, how much better it was to meet the difficulties, and endeavour to surmount them. If they met a difficulty with an honest desire to surmount it, it was astonishing how soon it went away. He was glad to see the workmen present, and he was sure they would yield to no one in their endeavour to do their duty. If he saw a man determined to do his duty, he cared not whether he wore fustian or broadcloth, for he generally found that those who prided themselves on their clothes were only drones in the working hive.

Mr. SPICE next proposed the health of John Moon, a man whom he was delighted to honour as the oldest servant of the Tunbridge Wells Gas Company, a man who had done his duty faithfully and honestly for the Company.

Mr. SCOTT desired to bear his testimony and appreciation of the manner in which Moon had at all times conducted himself.

The toast was drunk with musical honours, and Mr. SPICE called upon the workmen to drink in silence better health to Mr. Clements, the Clerk of the Works, who had unfortunately, through accident, lost the sight of one of his eyes, whilst discharging his duty to the Company.

The toast having been drunk in silence, Mr. SPICE proposed the health of Mr. Farrand, a gentleman to whom he felt greatly indebted for supporting him in carrying out some very important duties in connection with the starting of the works, when they were, as he might say, somewhere between wind and water—in the transition period between the old works and the new. The discharge of the duty involved a great amount of practical knowledge and aptitude to meet contingencies. Nothing but experience and intelligence could fit a man for such a work. When he called upon Mr. Farrand to make gas without coal, it was to carry out a scientific problem put to him, the practical solution of which involved almost the sacrifice of his life. This problem had been successfully carried out, in great part through the assistance rendered him by Mr. Farrand, who had succeeded, by adhering to instructions, in accomplishing the making of gas from water. It was Mr. Farrand who assisted him in the delicate operation of clearing the air with which the holders and mains were charged. The transition of the supply of gas from the old to the new works was not a simple one; it required skill and practical knowledge, backed up by experience. The works would that night be handed over to Mr. Scott, and it would now be simply a matter of adjustment, regulation, and order.

Mr. FARRAND having suitably replied, the dinner proceedings closed, and the evening was spent in singing and conviviality.

AMERICAN GASLIGHT ASSOCIATION.

[Abridged from the "Official Report" in the *American Gaslight Journal*.]

(*Continued from Vol.* XXXIV., *p.* 944.)

The proceeding on the second day of the meeting of the Association (Thursday, Oct. 16) were commenced by the presentation of a report by the Executive Committee as to the place of meeting next year. On their recommendation, it was resolved to hold it in Chicago.

General Charles Roome, who this year retired from the office of President, was elected an Honorary Member of the Association.

After some conversation as to the investment of the surplus funds in the hands of the Treasurer, the reading of papers was resumed.

Mr. CHARLES H. NETTLETON (Derby, Conn.) read a paper on

SUPPLYING GAS WITHOUT A HOLDER.

Early in June last I had the exceptional experience of supplying gas without a holder, and thinking the details of the work might possibly be of some use and interest to the members of this Association, I have jotted down a few notes relating to it, and trust that I shall present them in intelligible, if not in elegant English.

The circumstances and causes which led me to supply gas without a holder were as follows:—The Company I am connected with have but one holder, of a capacity of 50,000 feet. Owing to defective fastenings, the larger part of the wall plates against which the bottom rollers ran had fallen to the bottom of the tank, and as that gave the holder a great deal of play, it rose and fell very unevenly. It was invariably a foot higher on one side than the other, and sometimes two or three feet. Often the crown pulley got off the guide-rails, and occasionally it freed itself entirely, and fell over on its side. I was fearful that any day it might be so disabled that it would be impossible to use it.

This state of affairs had reached such a pass last winter that, although sending out over 40,000 feet, I did not dare raise it but half way up; and as the consumption was rapidly increasing, it was evident that by some means the holder capacity must be enlarged. The Directors voted to build a new holder; but that meant a debt, and consequently I exceedingly disliked adopting their plan. I knew that a city in Massachusetts had been supplied without a holder, and after paying a visit to the place and interviewing the Manager, from whom I received a great deal of encouragement to repair the holder, I resolved to make the experiment of supplying gas without it.

As a preparatory measure, a circular was sent to all the consumers, stating the fact that certain repairs were necessary, and requesting all to use as little gas as they could, and preparing their minds for a possible failure in the supply. The inlet and outlet of the holder were connected by a 4-inch pipe, the drips filled, and in that way the gas passed directly from the station-meter to the mains. In the ordinary supply only one bench of five retorts is used; but a second was fired up. These were each composed of four retorts 12 by 22 inches, and one 15 by 30 inches, all 9 feet long—giving in all 177 feet of retort floor.

In order to economize time, it was arranged to pump out the tank in the night. The holder was grounded at ten o'clock, and, of course, at the same moment gas was supplied direct from the retorts. For a short time more gas was sent out than was needed, and in consequence the pressure ran up from 1·6 to 3·0 inches; but by slacking lids this was soon reduced. The next day and during the following days it was quite easy to keep the pressure nearly uniform, by charging the retorts often with 50 lb. charges. The day man had instructions to watch the pressure-gauge carefully, and when the pressure had fallen to 0·9 inch, to put in a charge. This would cause it to run up to 1·4 inches, and then in about half an hour the operation would be repeated. In this way an average of 4460 feet was sent out each day, between seven o'clock in the morning and six o'clock in the evening.

For the night work, the following routine was generally observed, and as it worked well, I give it in full. (It was singular to notice that night after night a certain number of retorts were needed by a certain time, the variation being scarcely more than two minutes.) By half-past six all retorts were empty except one, and that contained a fresh charge of 150 lbs. with the pressure at 1·4 inches. All lids were ready luted, coal in waggons, and everything in readiness to charge when gas was needed. By seven o'clock the pressure would drop to 1·2 inches, and a charge of 300 lbs. was put in. It would then run up to 2·2 inches. By twenty-five minutes past seven it would fall to 1·6 inches, when another retort would be charged, and the pressure would increase to 1·8 inches. After ten minutes the pressure would commence again to drop, and on the slightest indication of this a third retort was charged. From this time on it was generally necessary to charge the remaining retorts as fast as two men could do the work. Once and once only the pressure dropped to 1·4 inches, and remained so for an hour; but otherwise it was maintained steadily, during the hours of a large consumption, at from 1·6 to 1·8 inches. After ten o'clock the pressure would increase so that the lids of one or more retorts were slacked. At twelve some fresh charges were needed; but the consumption was so slight that 100 to 150 lb. charges were sufficient, and at daylight this was reduced to 50 lbs. The average daily consumption was 18,100 feet, Sundays excepted.

In only one thing have I any cause for regret. The coal used during the daytime was so slight in quantity, and the heats so high, that the mains became filled with exceedingly poor gas, and this had to be consumed in the early part of the evening, before the fresh and rich gas reached the burners. As all of my time was spent at the works, I did not know how poor it was until one of the consumers spoke to me about it. If that had been avoided, either by the use of cannel or slacking the lids of the retorts before all the gas had been extracted, the work would have been done to my full satisfaction.

Before starting with this work, it was suggested to me that there would be considerable oscillation in the pressure, caused by the revolutions of the exhauster fans, and that the supply would for that reason be unsatisfactory. Such was not the case, however, as the oscillations in the pressure were generally half a tenth, and never greater than 2-10ths. It was so slight that I could not detect it in an ordinary burner.

From the experience in the city in Massachusetts to which I have referred, and my own, I conclude that for this work one square foot of retort floor is needed for every 100 cubic feet of gas consumed in the 24 hours.

Mr. COGGLESHALL, the Manager of the works in Massachusetts referred to in the paper, said his experience was substantially the same, when supplying gas without a holder, as Mr. Nettleton's.

Mr. CARTWRIGHT said he had had experience, not exactly of furnishing gas without a holder, but somewhat similar. At one time he had to construct a temporary holder, of a capacity of about 6600 cubic feet, and float it on the river. The holder was made of 3 by 4 inch scantling, and the sides were covered with ordinary 1-inch pine boards, overlaid with tin to make it tight. This holder being floated in the river, he was enabled to keep the supply going.

Mr. HARBISON inquired what yield Mr. Nettleton had from his coal at the time he was without a holder; also whether he found that financially it would be profitable to run gas-works without a holder.

Mr. NETTLETON replied that the yield of gas was 4 feet per lb. It was not profitable to run gas-works without a holder; and he would not advise stockholders to try it. It was a matter of economy with them at Derby; they could not afford to build another holder. Of course, during the week the holder was out of use, his expenses for coal were more than they ordinarily were.

Mr. HARBISON said that he had had asimilar experience to Mr. Nettleton's. About 15 years ago their holder was not of sufficient capacity to furnish all the gas demanded, and for a time they supplied direct from the mains. They thus were enabled to increase the supply and satisfy all demands.

Mr. M'ILHENNY could see no difficulty in supplying a small town without a holder, provided the manufacturing capacity was equal to the maximum consumption. It would, however, be impossible without holders to supply a large city. Where just such an amount of gas as was required could be made as it was wanted, there would not be any difficulty; but where the manufacturing capacity was less than the maximum consumption, it would be impossible.

Mr. CARTWRIGHT asked if Mr. Nettleton had very many complaints among his consumers during the time he was furnishing gas in the way he had described.

Mr. NETTLETON said that there were some complaints about the quality of the gas, some of the consumers saying it would scarcely light. This was caused by the mains being, in the early part of the evening, filled with poor gas; but, of course, when the fresh gas was sent along, it was of the ordinary quality. This could have been avoided by putting in cannel gas, or by not getting all the gas out of the coal. In fact, if he were to go over the same thing again, he could do better.

Mr. NEAL was disappointed with the conclusions arrived at by Mr. Nettleton after his experiments, as he had had great hopes that the paper would show how the cost of distribution could be reduced very materially by dispensing with holders. The result, however, was that it was found impracticable to dispense with them.

Mr. HELME was a little surprised at the view Mr. Neal took of the paper. He (Mr. Helme) had thought that Mr. Nettleton was simply going to give a little of his experience, in order to enable those who sometimes found themselves in tight places about Christmas week, to get out of them; and he thought it had been done very clearly. He was sure no member of the Association would understand that the paper advocated the running of gas-works without a holder. Any one knew that gas was made the whole day long, to be used up in about four hours; and it was further known that, at times (especially during Christmas week), there was a very large increase in gas consumption, and it certainly was of great importance that it should be known how to get out of the emergency when it presented itself. Mr. Nettleton had shown how he tided over precisely such an emergency as many were likely to find themselves in at certain seasons of the year. By adopting the suggestions he had made, 125,000 or 150,000 feet of gas might be sent out with holders of a capacity of 75,000 or 100,000 feet only. In Atlanta it had been done that very week—they had sent out 91,000 feet of gas with a holder capacity of only 80,000 feet, and they expected to be called upon to do the same thing again.

A vote of thanks was accorded to Mr. Nettleton for his paper.

(*To be continued.*)

INCREASE OF STORAGE BY THE CLEVELAND WATER COMPANY.—There has recently been completed, at Skelton, by the above-named Company, a service reservoir capable of holding 750,000 gallons, being an estimated supply of water for three days, for Saltburn and Marske. The revival in the iron trade is causing a large increase in the demand for water for boilers at the mines and at the blast furnaces, and all the Water Companies in the district are materially benefiting by the enlarged demand. The reservoir now completed will, it is expected, materially aid the Cleveland Company in their efforts to enlarge the area of distribution of their water.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week there has been very little actual business doing. Many of the collieries and iron-works have been closed for several days, either for stock-taking or the holidays, and the market has been little more than nominal; but, so far as there is any business doing, the tendency of prices continues upwards, and in the iron trade especially sellers are very firm.

The Lancashire collieries generally, although there has not been much going away during the last few days, are tolerably well supplied with orders, and upward movements in prices are announced here and there. Some of the firms in the Manchester district have put up their furnace coal 5d. per ton this month, and in slack there is a hardening tendency, although there is no actual advance upon the top prices which have been quoted in the market. The average quotations at the pit mouth may be given about as under:—Good Wigan Arley, 8s. 6d. to 9s.; second qualities, 7s. to 7s. 6d.; Pemberton four-feet, 6s. 6d. to 7s.; common house coal, 5s. 6d. to 6s.; steam and forge coal, 5s. to 5s. 6d.; burgy, 3s. 9d. to 4s. 3d.; good slack, 2s. 9d. to 3s. 3d.; and common, 2s. to 2s. 6d. per ton.

The increased demand for coke is causing prices in this class of fuel to harden, and some makers have advanced their quotations this month 10d. per ton.

In the iron trade it is difficult to say what prices are ruling at present, as there is so little iron just now, and particularly forge qualities, offering in the market, and as very few makers can quote at all for anything like reasonable delivery, holders of second-hand parcels are able to command pretty much their own price. Lancashire pig iron continues to advance, and this week quotations for delivery into the Manchester district are given at about 62s. 6d. to 63s. per ton, less 2½ per cent. For Lancashire bars delivered into the Manchester district, £8 10s. per ton has been about the nominal quotation; but as many of the makers have been refusing orders altogether, and a further advance is announced in Staffordshire, there is little doubt that after the holidays higher figures will be asked in this market.

The wages agitation in the coal trade continues; but, so far, the colliery proprietors are holding out against the demands of the men.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Business has been very much of a holiday character over the last fortnight. The weather, too, has been very unsettled and stormy in the North Sea; coasting steamers having thereby failed to keep their time, and have lost voyages. Last week was a broken one at many of the collieries. Altogether, the shipments of gas coals have been below an average. With regard to the coal trade generally, its prospects are improving every week. With the turn of the new year, collieries of all descriptions are likely to get into full employment; and where the trade has been the weakest over the past three or four years—that is, in the local demand—the second-class and inferior coals which have been a drug upon the values of round coals, are becoming a help. As this class of fuel, with coke, gets down to the lowest point possible for them to reach, without involving the coalowners in irretrievable ruin, so the advance in prices is likely to be the greatest as the improvement in the iron trade becomes further developed. The rise in the price of gas coals seems to have been settled for the first half of 1880, if the contracts which have been made are to be taken as the rule. The figure, stated roundly, is about 6s. 9d. per ton, reckoning the discount usually allowed. The price of second-class gas ranges from 6s. 3d. to 6s. 6d., reckoning discount.

With regard to the prospects of the coasting freights in the first half of 1880, there may be a rise of 3d. per ton; but in respect of business to London, the rate of freight will materially depend upon the manner the north country coalowners and London coal merchants settle existing differences. If the latter continue to declare "war to the knife," as they seem disposed to do, upon the coalowners, and "shunt" as many seaborne house coals out of the market as they can, there will be less steam tonnage employed in the house coal trade, and the gas-works and others will have a better command of steamers to enable them to keep up their supplies of coals.

A class of boat usually employed in the coasting trade is likely to be more extensively engaged this year in carrying the better qualities of iron ore from Spain to the United Kingdom. The Baltic trade, too, looks well for steamers. Small coasting vessels and the ordinary sailing colliers—the latter the common carriers of seaborne coals—of 20 or 40 years ago, continue to undergo a gradual process of extinction. Those afloat are very profitless to their owners, and when these vessels are lost they are never renewed. To some extent small coasting steamers occupy their places. But over the course of the next few years, all concerned in the coal trade to lesser ports of the East Coast, the English Channel, and Ireland will have to reckon upon a considerable diminution in the supply of small sailing tonnage, unless the coasting coal trade is replenished through the introduction of foreign vessels into the market.

The manufactured iron trade is kept busy. Most of the large iron-works and foundries are fully supplied with orders. Prices are well sustained. Lead keeps high. The last sale of superior qualities of Spanish lead realized £19 10s. per ton. The chemical trade improved last week. Prices advanced about 5 per cent. all round. The continental trade has made a good beginning with the New Year.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The great disaster of last Sunday week—namely, the destruction of a large portion of the Tay Bridge, together with the loss of well-nigh 100 lives—which may be regarded as a national calamity, was not unattended with features of melancholy interest to the gas world. Two of the victims were *employés* in the Corporation Gas-Works, Dundee. They were Alexander and William Robertson, brothers, the sons of Mr. William Robertson, salmon fisher, Abernethy. They had been at home visiting their parents during the day, and were returning to Dundee to be ready for their work on Monday morning. It may be remembered that on the occasion of the annual meeting of the North British Association of Gas Managers, held at St. Andrews, in July, 1878, the members spent part of the second day of the meeting in paying a visit to the bridge only a few weeks after its formal opening. They inspected it with a keen interest, and admired it in no mean degree. Judging by their own experience in the way of roofs blown off, gasholders blown over, boundary walls blown down, a number of the members who took part in that interesting visit will perhaps be able to form some notion of the extraordinary severity of the storm which raged over the Tay on the memorable night of the last Sunday of 1879.

This train of thought leads me to the mention of the fact that on the following night the storm, which still continued, performed some ravages in the West of Scotland. One of them was an accident to the smallest and oldest gasholder at the Paisley Corporation Gas-Works. The mishap was caused by the giving way of some of the guide pulleys, the supposition being that the storm of Sunday evening, when the holder stood somewhat high, had fractured or damaged the parts that gave way on Monday night, thereby causing the top lift of the holder to tilt over, and to effect considerable damage to the lower one. The amount of the damage is estimated at some hundreds of pounds, but the accident did not in any way affect the gas supply of the town.

In the annual statement of the revenue and expenditure of the various Municipal Trusts of Greenock, just published, the following items are given in reference to the gas affairs of the Board of Police:—Revenue, £38,128 7s.; expenditure, £34,060 4s. 3d.; gross debt, £117,731 16s. 10d. In connection with Greenock gas affairs, I may mention that as the result of 25 experiments officially made in regard to the illuminating power of the gas during the past month, the minimum was 26·47 candles; the maximum, 31·48 candles; and the average, 28·63 candles; the average temperature of the gas while testing being 58° Fahr.

The following figures have just been published in reference to the gas manufactured in Dundee during the last ten years:—

Year.	Gas Made.
1870–71	214,295,100 cubic feet.
1871–72	234,224,000 "
1872–73	252,294,300 "
1873–74	265,994,800 "
1874–75	268,945,000 "
1875–76	285,313,300 "
1876–77	292,604,700 "
1877–78	316,054,900 "
1878–79	322,807,700 "
1879–80	Estimate 325,000,000 "

In its annual review of local affairs, the *Dundee Advertiser* remarks that during the past year endeavours had been made to utilize the electric light in different places in the town; but for ordinary use they had only shown that it was not suitable. It was introduced at Messrs. Cox's works, and at the picture gallery in the Albert Institute, and was found, as hitherto, to be too fitful and glaring for purposes requiring steady and pleasant light. At Messrs. Gourlay's shipbuilding yard it is, however, in constant employment, and for outside work it seems not to be equalled when cost is not a matter of consideration.

With the view of getting at the most perfect system of street illumination, the Municipal Authorities of Aberdeen have recently obtained two of Bray and Co.'s lamps with flat-flame burners, one of 80-candle power and the other equal to 120 candles. The two lamps are said to be the first of their kind erected in Scotland for street illumination.

A correspondent, drawing attention to the question of street lighting in Buckhaven, states that the public meeting of which I spoke in my "Notes" last week, only consisted of 32 persons, of whom 11 voted for the motion and 7 for the amendment, while the remaining 14 declined to vote. He further says that the idea of erecting and maintaining street-lamps by public subscription is only entertained by a few parties, and that the inhabitants are to take a more practical method of getting the streets lighted by-and-by.

The Tay Bridge disaster has resulted in cutting off the supply of water, which was passed over to Newport by a system of pipes laid along the bridge from the Dundee system. As mentioned at a meeting of the Dundee Water Commissioners held last Wednesday, the lamentable accident to the bridge carried away upwards of 1000 yards of piping. The interruption to the supply has been attended with great inconvenience to the people of Newport. It was also stated that the Local Authorities had no claim against the Commissioners for the loss of their water supply, as there was a saving clause in the contract, freeing them from the consequences of any accident. In the meantime, Mr. Watson, the Manager of the water-works, is considering what can be done to lessen the inconvenience complained of.

It seems that the supply of water which the Town Council of Dunfermline are now giving to the town of Inverkeithing will entail on the consumers an assessment of not less than 2s. per £1 of rental.

The Glasgow pig iron warrant market was very strongly excited during the past week. An immense business was done daily, and the eager desire to buy seemed not to be abated. The fresh wave of buying from the United States and Canada has grown in volume, and Germany has also come forward as a buyer. On Friday as high as 68s. 6d. cash was paid, which was 6d. over the price paid during the panic last October; but the close was 68s.

THE PURCHASE OF THE COLCHESTER WATER-WORKS BY THE TOWN COUNCIL.—A special meeting of the Colchester Corporation was held on Wednesday, the 24th ult.—the Mayor (Mr. J. Kent) in the chair—to receive, and, if expedient, to adopt the report from the Water Committee, recommending that, should the vendors of the water-works undertaking not have taken up the award of the Arbitrators, the Council do so; also to deal with the question of the necessary loan. The Town Clerk (Mr. H. Jones) read the report of the Committee, as follows:—"Your Committee beg to report that they have received a notice from the Arbitrators that the award is ready to be delivered over on payment of £563 0s. 2d., and recommend that, should the vendors of the water-works undertaking not have done so, the Council take up the award forthwith. And your Committee are unanimously of opinion that the Council shall deal with the question of the necessary loan at once." He said that Messrs. E. Easton and G. W. Stevenson, the Arbitrators appointed to ascertain the amount of the net annual earnings of the Company and the value of the stock, &c., with a view to determining the amount to be paid by the Corporation for the purchase of the undertaking, had reported that, having gone into all the matters in relation to it, they had arrived at a price which they considered just—namely, £79,813 14s. 2d. They also found that each of the parties to the arbitration should respectively pay their own costs of the valuation. After some discussion, the award was received and entered on the minutes. Mr. Moy then moved—"That the Town Clerk apply to the Local Government Board for their sanction to borrow a sum not exceeding £100,000 for the purchase of the water-works, to be raised by loan on the security of the district-rate." Mr. B. Daniel seconded the resolution, and it was carried.

THE WATER SUPPLY OF SITTINGBOURNE.—On Tuesday, the 23rd ult., Major Tulloch, R.E., one of the Inspectors of the Local Government Board, attended at the Town Hall, Sittingbourne, to confer with the Sittingbourne Local Board, the Milton Improvement Commissioners, and the Milton Union Rural Sanitary Authority, as to the best means of providing the districts with an adequate water supply. His visit was really brought about by a petition which the Rural Sanitary Authority had addressed to the Local Government Board, praying them to issue an order combining the district of the three Authorities for the purpose of providing a common water supply for the united district, constituting a joint board of management, and giving such board power to purchase the water-works of the Sittingbourne Local Board. The result of the conference was that the proposed triple alliance was abandoned, and an arrangement suggested by which Milton will derive its supply of water from the

Sittingbourne works, instead of erecting works of its own. By the new proposal the Milton Commissioners will pay half the cost of erecting the works and laying the main to the point at which the junction with Milton will be effected; in other words, Milton would have to pay a sum of about £2000, and also one-third of the annual working expenses and maintenance. This basis was suggested by Major Tulloch as the only one likely to be mutually acceptable to the Milton Commissioners and the Sittingbourne Local Board. By this arrangement Sittingbourne will have the entire power of managing the works, and will be nominally the sole proprietors; and, on the other hand, the Milton Commissioners, while having the right in perpetuity of receiving all the water they require, without any stipulation as to quantity, and being in all respects on the same footing as Sittingbourne in the case of contingencies arising, will have to pay only one-third of the working expenses, and one-third of the cost of maintenance, while Sittingbourne will be paying two-thirds, which is a very fair set-off to the works still remaining in the hands of the Local Board. The Commissioners and the Local Board both assented to the basis of this agreement, the details only of which have now to be settled.

Consolidation of the Brooklyn Gaslight Companies.—Brooklyn is, says the *New York Plumber and Sanitary Engineer*, on the eve of being the theatre of the largest movement in the consolidation of gas companies ever carried through in that country. Monopoly is a distasteful term to the popular ear; but while the public reap a temporary benefit from the opposition of such interests as those represented in gaslight companies, the benefit is a fictitious and temporary one. The confidence in gas securities in New York is very strong; the old Company has for the first time in 30 years passed its semi-annual dividend, yet its stock has made no commensurate fall. The consolidation of the Brooklyn Companies is certainly interesting, as it will put the manufacture of gas and its sale in the hands of such an immense corporation, and one of such advanced ideas, that many new features in manufactures, experiments, and sale of gas will be developed. It is proposed to adopt, partly or entirely, the water-gas process. This process has become possible of late years, owing to the low price of anthracite and naphtha, and also to the expenditure on it of much engineering talent backed by capital. In Brooklyn, if it be adopted, the two processes will have a chance to run in opposition to each other in the hands of the same Company, so that an impartial comparison of the two methods may be looked for. The misfortune of the profession here has hitherto been that questions like this have been considered from too *ex parte* a point of view. The manufacturer of coal gas supported the economy of his own process, and ran down the naphtha and water-gas engineers, while these latter, up to a late period, for some of the reasons assigned, really did fail to give good evidence of success. Most of our best coal gas engineers do not believe in water gas, and the question in this vicinity is now of the greatest degree of importance it ever has reached. But the water-gas phalanx embraces a number of conservative men who formerly frowned it down. Whatever our personal bias, we must acknowledge that both sides possess good advocates, and for that reason must be glad to see the question in a fair way of being decided within the next few months. Should the consolidation take place, it will be of far more than local interest; it will offer to the country the spectacle of consolidation on the largest scale, and recommend or condemn this solution of similar cases in other cities.

The Purchase of the Margate Water-Works by the Town Council.—At a meeting of the Margate Town Council last Tuesday, the question of the purchase of the water-works by the Council was discussed, the Committee reporting that, with the view to the completion of the purchase, they had examined the accounts furnished by the Company, of the expenditure and receipts since Jan. 1 last year, and they found that the balance due to the Company was £473 10s. 10d., which they recommended should be paid. The Town Clerk (Mr. Foord-Kelcey) stated that the Company had in hand the proceeds of the sale of some Three per Cents., which realized £293 5s. 5d., leaving a balance of £80 5s. 2d. to be made good by the Council to square the account. The parliamentary expenses incurred since Jan. 1 last year had been put into the account—viz., £327 17s. 11d.—and there was redemption of tithes, which amounted to above £70, making nearly £400 on account of extraordinary expenditure during the year. Mr. Bloxham moved that the amount due to the Company be left open for further consideration. He wished to see the works handed over to the Corporation; but he thought certain accounts needed investigation. The Mayor said that could be done. If they did not adopt the report then, the matter must stand over altogether. On Jan. 1 they must pay the balance and take possession, or the purchase must be deferred for another year, and this would involve the loss of the interest on the £60,000. Alderman Chambers objected to the purchase on several grounds, the principal ones being that the price agreed upon—viz., £59,000—was excessive, that a better supply of water could be obtained from the Dane than was now provided by the Company, and that the mains, &c., were not in good condition. Mr. Coleman thought they should have had more time for making the final arrangements, and that several of the items were open to question; but he would be unwilling to cause any delay. Still, he thought the Directors, having made such a good bargain for the Shareholders and themselves, might have met the Council more liberally. He also thought the burgesses had been under a great disadvantage in consequence of the Company being so largely represented on the Council, and that it placed such a gentleman as Alderman Pickering, for instance, in a very unenviable position to have to transact the business, in a large measure, for both the vendors and purchasers. After further discussion, a motion for the adoption of the report and the completion of the purchase of the works was carried by 7 to 2. The works were transferred to the Town Council on the 1st inst., the whole of the purchase-money (£59,000) having been raised by debentures subscribed in the town, and repayable within 60 years.

Register of Patents.

2397.—Lake, W. R., Southampton Buildings, London, "*Improvements in apparatus for carburetting gas.*" A communication. Provisional protection only obtained. Dated June 15, 1878.

This invention relates to an apparatus or carburetter, divided into two general compartments or sections by a diaphragm, the upper compartment or section forming a tank, and the lower compartment or section forming a generator. Within the generator there are two horizontal shelves or discs arranged one above the other, provided with upwardly turned lips or flanges around their peripheries, and with a series of perforations surrounded with upwardly projecting nipples or guards. Each of the shelves is also provided with a gas-pipe or duct, and is fitted closely in the body of the generator. Between the bottom and lower shelf there is a spiral or evolute gas-duct, composed of a vertically arranged coiled strip of sheet metal, and between the shelf and the upper shelf there is a like coil or duct. The lower shelf rests upon the lower coil, and the other shelf upon the upper one, and between the upper shelf and diaphragm there is a series of radial partitions provided with lateral openings, and a tube on which the diaphragm rests.

The tube and partitions are provided with small openings near the bottom, but both the partitions and the tube may be omitted if desired; or the partitions may be used on all of the shelves, and also on the bottom, if desired, instead of the spiral ducts, the spaces between being filled with wool, sponge, or other good absorbent; but the spiral ducts are preferable. A float is disposed in a well in the lower part of the generator, this well being provided with a tubular extension reaching above the upper shelf, and surmounted with a parachute or cap, through which the float-rod passes. A screw plug is fitted closely in the diaphragm, and through the centre of this plug there is a vertical opening, in which the stem of the valve works loosely. The upper side of this valve, the diameter of which is nearly as great as that of the cap, is covered or packed with leather, and there is a series of perforations or conduits leading from the tank through a plug to an opening in which the stem works, and thence to the generator below. A valve, concave on its lower side, is provided to receive the upper end of the float rod, and in the upper end of the stem there is a pin to prevent the dropping of the stem too low as the float falls.

The walls of the coils, the lower sides of the shelves and diaphragm, the sides of the partitions and tube, and the interior walls of the generator are to be covered with felting or cloth for absorbing the gasolene or hydrocarbon oil, and thus producing a greater evaporating surface.

2440.—Sugg, W. T., Vincent Street, Westminster, "*Improvements in counterbalances for gasholders.*" A communication. Patent dated June 19, 1878.

This invention has for its object the construction of counterbalances for gasholders in such a manner as to offer great facility for varying their weight in accordance with the pressure it is desired that the holder shall give, and consists in providing as many iron tanks (either galvanized or otherwise) as it is requisite to have counterbalance weights. One of the tanks may be suspended from the holder near each column, or each intermediate column, by a chain which passes over suspension pulleys, the same as when iron weights are employed as counterpoises; or one tank only may be used, having chains fastened to it which pass over appropriate pulleys, and are fixed to the holder at suitable points of suspension. On each side of each column to which these tanks are applied there is a guide-rod or bar rising from the curb of the holder tank to the girders connecting the tops of the columns. These guide-rods or bars pass through eyes attached to each tank, and serve to guide the tank, so as to prevent it from striking against the holder when rising or falling.

For guides, grooved wheels may be substituted instead of eyes, and arranged to roll against the vertical bars.

Near each column, and rising to about the top of the girders, is a water-pipe, curved at the top, so that its mouth and a flexible tube depending therefrom may be over its corresponding tank. When the holder is down and about to be raised by the incoming gas, the tank or tanks will be elevated, and water is then caused to flow from each of the pipes into its tank until the weight of the tanks and the water contained in them counterpoises the holder, or reduces the pressure of it to the requisite extent. When the holder is full and the supply of gas to the district is about to commence, water may be withdrawn from the tanks by suitable pipes and taps until the holder gives the desired pressure. The taps may be so arranged as to be capable of being opened or closed by means of rods, levers, chains, or wire ropes, even when they are at a considerable altitude from the ground, and the water in falling may be directed into the holder tank.

2489.—Redwood, T., Lower Clapton, London, "*Improvements in the manufacture of gas for burning.*" Patent dated June 22, 1878.

The improvements comprised in this invention relate to certain modifications of a process for the manufacture of gas, for which the present inventor, in conjunction with T. B. Redwood, obtained a patent, No. 2105, dated May 30, 1877. [See Journal, Vol. XXXII., p. 429.] In that process the removal of dust and the solid and more easily condensable constituents of tar from the crude gas as it issues from the hydraulic main, the introduction of the thus partially purified gas into the part of the apparatus called the converter, together with as much as possible of the volatile hydrocarbon oils usually present in the tar, the dilatation or expansion of the gas by means of an exhauster, and the addition of steam to it during its passage through the converter, are important features of the invention, by the combined influences of which the inventors state they are enabled to apply to the gas and vapours the required degree of heat for increasing the volume of the gas by breaking up the more complex and condensable molecules and converting them into permanent gas, and for otherwise augmenting the value of the gas as a source of light.

In that process the gas is subjected, as it passes through the converter, for a limited time to a temperature of about 1100° Fahr. For effecting this purpose the converter is filled with balls or masses of solid substances arranged so as to break up the current of gas and expose to it a large heated surface. The solid substances used in the converter are most efficacious when they have a porous or spongy texture, and the present inventor states he has found that other substances besides those named in the 1877 patent, if brought into this condition, may be used with effect. Thus glass, slag, brick, or baked clay, and other similar substances, may be used if reduced to powder and afterwards made into a paste by mixing them with some agglutinating and other materials, which, when the paste has been dried and baked, shall cause it to have a porous texture, so that it may be easily permeated by the gas.

The modifications now introduced in the process relate to the materials that may be used in the converter, and the method of preparing such materials so as to increase their efficacy, by causing them to be very porous, and otherwise adapted for the purpose contemplated.

China or other dry clay is used as an agglutinating material, and a mixture of equal parts of powdered alum and bicarbonate of soda is employed for the purpose of causing the required porous texture of the prepared balls or masses. Also iron nails or other small pieces of iron are employed for aiding the conduction of heat into the centres of the porous balls, and through the balls to the centres of the converting cylinders. This method of preparing the balls is applicable to those made with plaster of Paris, which is preferred, and also to those made with the other materials named.

The following example will serve to illustrate the method of preparing the balls:—To 10 lbs. of plaster of Paris and 10 lbs. of china clay are added 2 lbs. of powdered alum and 2 lbs. of bicarbonate of soda. Having thoroughly mixed these powders together, sufficient water is used to form a plastic mass, which is divided into balls or masses about the size of an egg. By the mutual reaction of the alum and carbonate of soda, carbonic acid gas is evolved in the paste. This causes the balls to swell and become porous, like the rising of dough in making bread. While the balls are still soft there are introduced into each ball, at different parts of its surface, five or six cast-iron nails long enough to pass from the circumference to near the centre. The balls are afterwards dried and baked, when they retain their porous condition, and are employed in the treatment of the gas in the manner described in respect to the use of plaster of Paris in its natural or usual form in the specification of the 1877 patent.

2516.—Mead, W., Laurence Pountney Hill, London, "*An improved process for converting into caustic lime spent lime which has been used in the purification of illuminating gas.*" A communication. Patent dated June 24, 1878.

In carrying this invention into practice the spent lime is first pressed into bricks or blocks, the operation being effected by the same means that are employed for forming ordinary bricks. The bricks are then placed in a kiln, and subjected to increasing heat sufficient to drive off the moisture, ammonia, carbonic acid, and sulphur which the lime has absorbed in purifying the gas. An ordinary brick press, which may be operated either by hand or other power, is used. The length of time necessary to carry out the operation depends somewhat upon the size of the kiln and the intensity of the heat; but as the blocks will shrink in size as they lose carbonic acid, sulphur, and the like, it can be ascertained from such shrinkage when the burning is finished. From 20 to 36 hours should be sufficient to accomplish this object.

[An illustrated description of the process to which this patent refers is given in our "Correspondence" columns this week—see *ante*, p. 16.]

2525.—Boulton, M. P. W., Tew Park, Oxford, "*Improvements in gas motor engines.*" Provisional protection only obtained. Dated June 25, 1878.

According to these improvements the heat abstracted from the cylinders is used to generate steam to assist in working the engine. The combustible charge is contained in two cylinders and caused to enter a receptacle in the main cylinder of the engine, where they are mixed and undergo combustion. As the charges are expelled from the cylinders, fluid from the receptacle enters behind the charging piston. The fluid works in two cylinders. In the working stroke the fluid passes to the smaller one, expanding therein, and by the difference of the areas the pistons perform their work. A refrigerator and passages governed by valves are provided, so that the fluid can pass from one cylinder to the other, either through the refrigerator or through another passage.

2526.—Kirkham, T. N., Abingdon Street, Westminster, and Chandler, S., Newington Causeway, "*Improvements in gas-purifiers or scrubbers.*" Provisional protection only obtained. Dated June 25, 1878.

This invention consists in making the layers or strata in gas-scrubbers or washers of non-porous materials, preferably of glass, or of substances coated with a vitreous matter, and of a spheroidal, globular, or oval shape. By the adoption of a uniform regular shape in these scrubbing materials—say the globular—the area of the space of the beds or strata of filtering materials may, the inventors state, be decreased in the ratio of one-third, which effects a great saving in the cost of the scrubbing vessel, and in the cost of the materials used therein. The invention is applicable to the horizontal as well as to the vertical form of washer or scrubber; and when the horizontal form is used the spheroidal scrubbing materials may be placed in a cage or drum, and revolved in a vessel or vessels containing water.

2533.—Shedlock, J. J., Notting Hill, London, "*Improvements in the manufacture and purification of gas, and in apparatus connected therewith.*" Patent dated June 25, 1878.

In carrying this invention into effect, the coal or other solid hydrocarbon is first treated in the ordinary manner for the abstraction of its gases; the liquors condensed from the gas are then treated so as to convert them also into gases, which are combined with those given off from the coal.

For this purpose the tar, as it condenses, is conveyed into a retort charged with coke or other suitable material, and heated to the required temperature. The ammoniacal liquor condensed from the gas, in being conveyed to the retort, is subjected to a certain temperature for the purpose of vaporizing the ammonia, and the remaining water may be either conveyed directly to the retort, or on its passage it may be converted into steam and superheated, in which state it passes through the coke or other material contained in the heated retort, and by which means it is decomposed into its elements. The hydrogen, in its highly-heated state, is brought into contact, in the upper part of the retort, with the nascent gas or vapour produced by the distillation of the tar, and in which condition a combination will take place between the hydrogen and the heavy hydrocarbon gases or vapours. These gases are then conveyed by pipes to the chamber or vessel, where they are intimately mixed with the gases first produced, and with the gaseous ammonia. The combined gases are then conveyed by pipes to the apparatus, in which they are brought into contact in minute quantities with the liquid contained in the apparatus, which will cause a combination to take place between the acid and the alkaline impurities contained in the gas. This liquid may be water, or, if preferred, an alkaline solution for the purpose of neutralizing the acid impurities contained in the gas.

In producing a gas by the distillation of a liquid hydrocarbon, a similar retort and apparatus may be used, omitting the retorts in which the coal or other solid hydrocarbon is treated, and using only that in which the tar is distilled and the water or its vapour is decomposed; but in order that the gas produced may be of uniform quality, it is necessary to carefully regulate the relative qualities of water, or its vapour, and liquid hydrocarbon entering the retort.

2538.—Hart, J., Sampson, J. L., and Colebrook, C. T., London, "*Improvements in the construction of pumping-engines.*" Patent dated June 25, 1878.

In these engines the air-vessel and pump-barrel are made in one or more parts, in such a manner that the pump-barrel, which is made with an open top, is formed within and at the lower part of the air-vessel, and divides it into suction and delivery compartments, each of which is furnished with an air space, and the steam cylinder is placed at the opposite end or top of the air-vessel and bolted thereto. The piston-rod passes direct from the steam cylinder into the air-vessel, and works through a comparatively deep guide. It is packed either with rings, or may pass through suitable packing arranged within the guide.

2575.—Pieper, C., Dresden, "*An improved water-meter.*" A communication. Patent dated June 26, 1878.

This meter consists of two cylinders provided with pistons, the rods of which act by suitable connecting-rods on a common crank-shaft. The cylinders are either placed at an angle to each other—by preference at a right angle, and in this case the two connecting-rods may operate on a single crank—or they are fixed opposite to each other, which position requires the shaft to be provided with two cranks, arranged so that the one is acted upon by its connecting-rod, while the other passes either of its dead centres. The water passes from the supply-pipe into a chamber, from which it is admitted into either cylinder by a slide-valve. These slide-valves, which will also cause the water to be discharged, are worked by a crank or cranks on the shaft of the apparatus. A counter is connected with the shaft, for registering its number of revolutions; or, what is generally preferred, the number of gallons, cubic feet, &c., dependent upon these revolutions and the contents of the cylinders.

2609.—Boulton, M. P. W., Tew Park, Oxford, "*Improvements in gas motor engines.*" Provisional protection only obtained. Dated June 29, 1878.

In this engine a vertical cylinder with a piston has at the lower end apparatus for introducing the mixture of gas and air. The upper end of the cylinder contains a steam space, and the piston carries on its upper side a certain quantity of water in contact with the interior surface of the cylinder. The hot gases resulting from the combustion of the mixture as they expand and drive the piston upwards heat the metal of the cylinder; and on the return stroke the piston brings the water in contact with the heated surfaces, when steam is generated in the space above the piston.

2644.—Alsing, G. V., Bradford, Yorks, "*Improvements in the treatment of sewage and other polluted waters and their deposits, and in apparatus employed therein.*" Provisional protection only obtained. Dated July 2, 1878.

According to these improvements, 1 part of sulphuric acid is added to 80 parts of sewage, and the heavy parts allowed to deposit in a catch-pit. It is then screened, and mixed with one ton of clay to every million gallons of sewage. It afterwards passes to a depositing tank, the liquid portion being filtered off through coke, whilst the sludge deposited is removed and used in the manufacture of bricks, drain-pipes, and other purposes for which clay is employed.

2662.—Kenyon, H., Warrington, "*Improvements in purifying gas and in the manufacture of ammoniacal salts.*" Provisional protection only obtained. Dated July 3, 1878.

These improvements consist in saturating dried sawdust with about 75 per cent. of chloride of zinc, and the absorbent so produced is put into the purifier in place of lime or oxide of iron, and chloride of ammonium is thus formed, also oxide of zinc. By continuing the operation, part of the oxide of zinc is dissolved by the ammonia, and chloride of ammonium and ammoniate of zinc are retained, along with a little tar and sulphur and any of the oxide of zinc not dissolved. This is washed with water or washings from a previous operation, or with ammonia and water, if it be desired to dissolve all the oxide of zinc, thus obtaining chloride of ammonium and ammoniate of zinc salts in solution.

If oxide of magnesia be required, the chloride of magnesium is dissolved, and dried sawdust is saturated therewith (whilst the chloride is hot, if a strong solution be wanted), containing, say, from 30 to 40 per cent. of chloride of magnesia, and this is used in place of the chloride of zinc absorbent, and thus chloride of ammonium and oxide of magnesia are produced.

Gas may be washed with these salts in any convenient washer without sawdust, the same salts being formed.

2680.—Ball, C. J., Brompton, London, "*Improved apparatus for raising and pumping liquids.*" Patent dated July 4, 1878.

In this apparatus a pipe of suitable size is immersed in the liquid to be raised, and a current of compressed air or other gas is forced into the pipe at a convenient depth, so as to destroy the equilibrium between the outside liquid and that within the pipe, thereby causing an upward current which would draw with it any material that might be in the liquid in which the apparatus is immersed. A current of water under suitable pressure may, however, be used instead of compressed air.

2683.—Foulis, W., Glasgow, "*New or improved apparatus for governing the flow and pressure of water and other liquids.*" Patent dated July 5, 1878.

This invention is in part based upon the apparatus for regulating the distribution of gaseous bodies described in the specification of a patent granted to the present inventor, dated Sept. 19, 1876, No. 3655. [See Journal, Vol. XXIX., p. 660.]

According to the first modification, the governor consists of a casing with inlet and outlet openings, and wherein is contained a valve having a cylindrical prolongation, the diameter of which is equal to that of the valve. This cylindrical prolongation fits into a corresponding chamber in the casing, and is packed either with a cup leather, asbestos, or with the equivalent thereof. The inlet of the apparatus is on one side of the valve-seat, and the outlet on the other side. The cylindrical chamber is connected by a pipe, either with the inlet side of the governor or with any separate source of liquid supply, which liquid, acting upon the piston of the governor, regulates the extent of opening of the valve, and thereby produces the requisite outlet pressure. On this pipe a regulator may be placed for varying the pressure in that chamber according to the outlet pressure required.

In cases where it is thought desirable to reduce the travel as well as the diameter of the valve of the governor, two valves of equal diameter on a common stem may be used, and where it is desired to maintain a constant ratio between the inlet and outlet pressure, the area of the piston is made less than that of the valve or valves.

For the purpose of controlling the pressure of water in pipes other than main-pipes—such, for example, as in the service-pipes to houses—there is placed on the pipe a double piston-valve loaded by weights, which maintain the valve open until the outlet pressure begins to rise above the desired point, in which case this outlet pressure acting upon the under side of the piston-valve and against the weights, causes the piston to move until it closes the inlet to the required extent for reducing the outlet pressure to the fixed point. The communication between the inlet and outlet may consist of a series of narrow slits or their equivalents, for the purpose of ensuring a gradual action.

The form of apparatus last described may be applied to the pipe communicating with the piston chamber of the governor first described, in which case it is provided with an overflow opening communicating with the outlet or with the drain.

In cases where a limited pressure is available for acting on the piston of the governor first described, the piston may be of larger area than that of the valve.

2686.—Cowan, W., Edinburgh, "*An apparatus for automatically varying the load and pressure in gas governors.*" Patent dated July 5, 1878.

This apparatus—The Automatic Pressure Changer—formed the subject of the two papers read by Mr. Cowan at the last meetings of the British and North British Associations of Gas Managers. [See Journal, Vol. XXXIII., p. 981, and Vol. XXXIV., p. 299.]

APPLICATIONS FOR LETTERS PATENT.

5195.—Maynard, H. N., Westminster, "Improvements in the construction of hydraulic valves for controlling gas and fluids." Dec. 19, 1879.

5197.—Haddan, H. J., Westminster, "Improvements in the mode of purifying gas." A communication. (Complete specification.) Dec. 19, 1879.

5209.—Ross, A. Q., Cincinnati, U.S.A., "Improvements in apparatus for charging and discharging the retorts of gas manufactories." (Complete specification.) Dec. 20, 1879.

5236.—Salsbury, H., Long Acre, London, "Improvements in or applicable to gas-stoves for heating 'soldering irons' or copper bits,' parts of which are applicable for other gas-heating purposes." Dec. 22, 1879.

5239.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in valves for steam, gas, and air engines." A communication. Dec. 22, 1879.

5256.—Nicolaïdes, A., Constantinople, "Improved means of generating motive force by the combination of water and air, or by the combination of water and gas." Dec. 23, 1879.
5267.—Sugg, W. T., Westminster, "Improvements in the construction of gas lamps or lanterns." Dec. 24, 1879.
5275.—Wild, J., Huddersfield, Yorks, "Improvements in the method of and apparatus for regulating or controlling the pressure of gas, being also applicable for regulating or checking the pressure of steam, water, or other fluids." Dec. 24, 1879.
5283.—Smith, A. H., Clifton, Gloucester, "Improvements in gas-stoves." Dec. 26, 1879.
5310.—Bonneville, H. A., Paris, "Improvements in the manufacture of gas, and in the apparatus used therefor." A communication. (Complete specification.) Dec. 29, 1879.
5323.—Bull, H. C., Brooklyn, U.S.A., "Improvements in the manufacture of gas and in apparatus therefor, and for other purposes." Dec. 31, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2537.—Young, W., Clippens, N.B., "Improvements in the utilization or employment of certain mineral oil products for the manufacture of illuminating gas." June 25, 1879.
2641.—Shone, I., Wrexham, Denbigh, "Improvements in and relating to apparatus for raising and forcing water or other liquids." June 30, 1879.
2685.—Holman, S., Queen Victoria Street, London, "Improvements in apparatus employed in the manufacture of gas." July 2, 1879.
2710.—Hallsworth, S., Armley, and Bailes, R., Woodhouse Carr, Yorks, "Improvements in treating burnt residue from spent oxide of iron, to be used or employed in purifying coal gas." July 3, 1879.
3555.—Siemens, F., Dresden, Germany, "Improvements in burners for gas, petroleum, and other lamps or lighting apparatus." Sept. 4, 1879.
3747.—Cox, J. B., Torquay, Devon, "Improvements in gas regulators or governors for regulating the supply and pressure of gas." Sept. 18, 1879.
3848.—Grice, W., Birmingham, "Improvements in retorts used in the manufacture of coal gas." Sept. 24, 1879.
4035.—Wilson, H., Stockton-on-Tees, Durham, "Improvements in apparatus for blowing, exhausting, cooling, heating, purifying, and attemperating air, gas, and fluids." Oct. 6, 1879.

PATENTS WHICH HAVE BECOME VCID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

4459.—Gent, P., "Improvements in and appertaining to gas-stoves." Nov. 18, 1876.
4526.—Symes, G., "Improvements in apparatus for manufacturing, purifying, and economizing gas, parts of which improvements are applicable for other purposes." Nov. 22, 1876.
4563.—Kelen, L. Van der, "Improvements in gas-stoves." Nov. 25, 1876.
4576.—Mathieson, C. F., "Improvements in the manufacture of gas." Nov. 25. 1876.
4585.—Russell, T., "A new or improved method of charging and drawing gas-retorts." Nov. 27, 1876.
4633.—Twentyman, A. C., "Improvements in fire-grates and furnace-grates." Nov. 30, 1876.
4675.—Howard, E., "Improvements in apparatus for preventing waste of water in water supply to closets, drinking fountains, wash-hand basins, and other water supply appliances." Dec. 2, 1876.
4824.—Foulis, W., "Improvements in drawing retorts, and in the machinery or apparatus employed therefor." Dec. 13, 1876.
4830.—Bromley, U., Crowe, G., and James, W., "Improvements in and relating to motive-power engines and pumps, applicable also in part to water-meters." Dec. 14, 1876.

Share List of Gas and Water Companies.

(Corrected by Mr. Arthur G. Prater, 23, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.
	£	Gas Companies.	£ s. d	£ s. d	£
589892	10	Alliance and Dublin	10 0 0	10 0 0	15½—16
10000	20	Anglo-Romano . .	20 0 0	10 0 0	21—23
5000	20	Bahia (Limited). .	20 0 0	4 0 0	12—13
1500	20	Do., 2nd pref. . .	20 0 0	7 10 0	20—22
40000	5	Bombay (Limited).	5 0 0	7 10 0	5¾—6¼
10000	5	Do., fourth issue.	4 0 0	7 0 0	¼—1¼ pm.
10000	10	Bournemouth . . .	10 0 0	8 0 0	13½—14½
229700	..	Brentford	100 0 0	9 0 0	148—53
..	..	Do., 5 per ct. pref.	100 0 0	5 0 0	95—100
..	20	Do., C shares . .	18 0 0	9 0 0	6—8 pm.
5400	20	Brighton	20 0 0	10 0 0	32—34
5000	20	Brighton and Hove	20 0 0	10 0 0	32—34
14000	20	British (Limited) .	20 0 0	10 0 0	32—34
7223	20	Cagliari (Limited).	20 0 0	6 10 0	16—18
1500	10	Colney Hatch . . .	10 0 0	5 0 0	9—10
5500001.	Sk.	Commercial	100 0 0	11 0 0	173—178
700001.	Sk.	Do., 7 per cent. .	100 0 0	8 0 0	135—40
20000	20	Continental Union.	20 0 0	6 10 0	17—18
20000	20	Do., new	14 0 0	6 10 0	3-2 dis
10000	20	Do., preference .	20 0 0	7 0 0	22—23
750001.	Sk.	Crystal Palace District	100 0 0	10 0 0	170-5xd.
1250001.	Sk.	Do., 7 per cent. .	100 0 0	7 0 0	125—30
500001.	Sk.	Do., preference .	100 0 0	6 0 0	118—123
25000	6	Do., ordinary 7 per cent. . . .	1 4 0	7 0 0	¼—¼
7100	25	Edinburgh	25 0 0	10 0 0	46—48
23406	10	European (Limited)	10 0 0	10 10 0	17—15
12000	10	Do., new shares.	7 10 0	10 10 0	4—5 pm.
35406	10	Do., new shares .	5 0 0	10 10 0	2—3 pm
40963001.	Sk.	Gaslight & Coke A.	100 0 0	10 10 0	172—75
1000001.	Sk.	Do. B.	100 0 0	4 0 0	73—77
50000	10	Do. do., 5th do. .	10 0 0	5 0 0	15¾—16¼
2000001.	Sk.	Do. C 10 p.c. pref.	100 0 0	10 0 0	205—210
3600001.	,,	Do. D do. do. .	100 0 0	10 0 0	205—210
1650001.	,,	Do. E do. do. .	100 0 0	10 0 0	205—210
300001.	,,	Do. F 5 do. do. .	100 0 0	5 0 0	101—4
600001.	,,	Do. G 7½ do. do. .	100 0 0	7 10 0	150—156
13000001.	,,	Do. H	100 0 0	7 0 0	125—128
589892	10	Georgetown, Guiana	5 0 0	7 0 0	4¼—4¾
300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	203—210
115000	100	Do., do.	100 0 0	6 15 0	155—160
..	100	Grimsby Gas, A. .	100 0 0	..	186—190
10	10	Hampton Court . .	10 0 0	10 0 0	15—16
7800	10	Hong Kong (Lim.)	10 0 0	10 0 0	14½—15½
5000	10	Hornsey	10 0 0	10 0 0	15—16
2000000/	100	Imperl. Continental	100 0 0	10p.c.& 2 p.c.	172—175 bonus
..	..	Kingston	..	..	..
..	..	Lea Bridge	..	7 0 0	11¼—12¾
56100/.	100	Liverpool United .	100 0 0	10 0 0	180—185
169100/.	100	Do., B	100 0 0	7 0 0	125—135
386500/.	Sk.	London	100 0 0	10 0 0	175—178
150000/.	Sk.	Do., 1st pref. . .	100 0 0	6 0 0	120—125
7622	25	Do., A shares . .	25 0 0	6 0 0	29—31
266927.	Sk.	Do., Debent. stk.	100 0 0	5/. & 6/.	..
15000	5	Malta and Mediterranean (Limited).	5 0 0	2 10 0	2—2½
6000	5	Do., preference .	5 0 0	7 10 0	5—5½
20000	5	Mauritius (Limited)	2 5 0	1 0 0	1¾—1¼ dis
25000	20	Monte Video (Lim.)	20 0 0	6 0 0	13—14
8000	10	Nictheroy, Brazil (Limited)	10 0 0	5 0 0	3¾—4¼
30000	5	Oriental (Caleutta).	5 0 0	9 0 0	6¾—7
30000	5	Do., new shares .	3 10 0	9 0 0	2—1¼ pm
10000	5	Ottoman (Limited).	5 0 0	3 0 0	2—2½
10000	10	Pará (Limited) . .	10 0 0	4 10 0	4¾—5½
27000	20	Phœnix	20 0 0	10 0 0	33—35
3600001.	100	Do., new max. 7½	90 0 0	7 10 0	111—115
1440001.	Sk.	Do., capitalized .	100 0 0	5 0 0	95—99
20	Do., new, 1876. .	16 0 0	10 0 0	13-15pm	
10	Richmond (Surrey)	10 0 0	10 0 0	16—17	
..	Rio de Janeiro (Limited)	20 0 0	10 0 0	25—26	
1500	32½	Shanghai	32 10 0	12 0 0	.. [pm
135000	100	Sheffield, A	100 0 0	10 0 0	197—198
99700	100	Do., C	100 0 0	10 0 0	195—197
615600	100	Chelsea	100 0 0	6 10 0	170—174
1624700	100	East London . . .	100 0 0	6 10 0	173—178
10798	50	Grand Junction .	50 0 0	5 0 0	99—101
5840	25	Do., ½ shares . .	25 0 0	5 0 0	49—51
6160	25	Do., new ditto; max. div., 7½ p.c.	25 0 0	5 0 0	44—48
5551801.	100	Kent	100 0 0	8 0 0	225—235
7818001.	100	Lambeth	100 0 0	6 10 0	172—177
3261501.	100	Do., max., 7½ p.c.	100 0 0	6 10 0	173—177
442	100	New River	100 0 0	10 3 8	320—350
4475	100	Do.	85 0 0	10 3 8	280—300
400000	100	Do., deb. sk., 4p.c.	100 0 0	4 0 0	101—103
6668001.	100	Southwrk & Vauxh.	100 0 0	6 0 0	162—165
3247001.	100	Do., pref. stock.	100 0 0	5 0 0	143—148
1265001.	100	Do., D shares. .	100 0 0	6 0 0	132—135
700001.	100	Do., new ordnry.	...	4 10 0	..
1600	100	Do., nw. ord. No. 1	40 0 0	4 10 0	..
15073	61	West Middlesex .	61 0 0	6l. p.sh.	162—165

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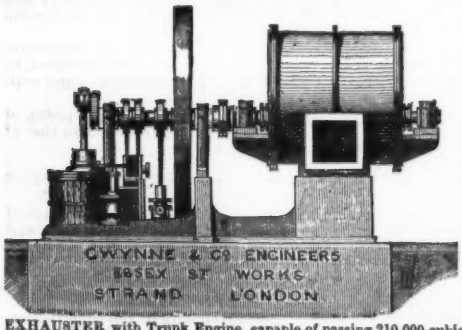

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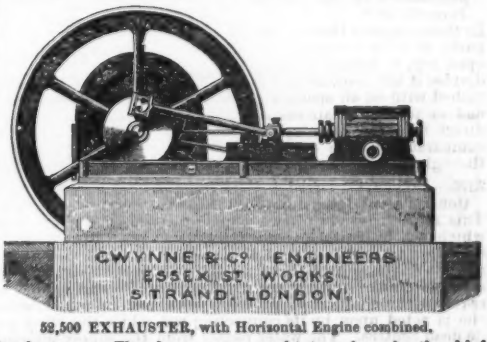

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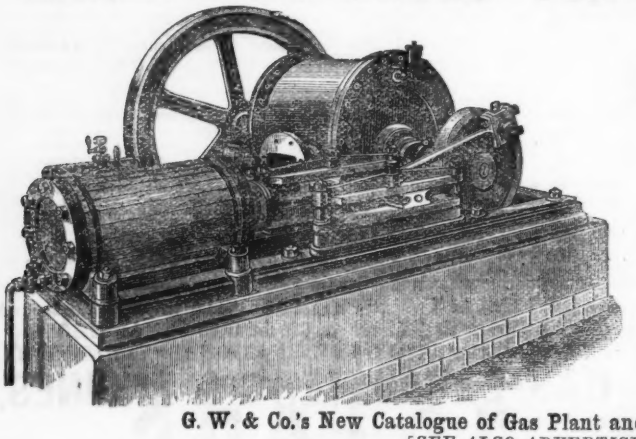

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[*SEE ALSO ADVERTISEMENT, PAGE* 38.]

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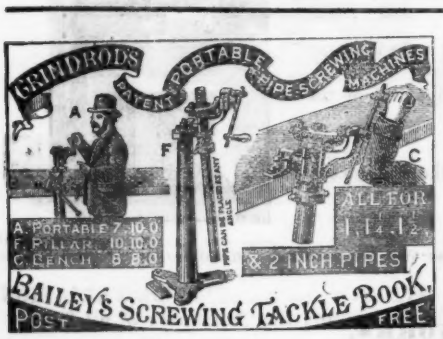

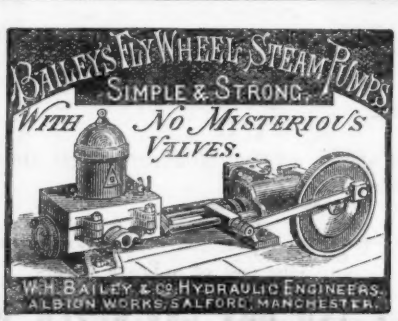
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No.	Diameter of Steam Cylinder.	Diameter of Pump.	Length of Stroke.	Gallons pr. Hour. Approx.	Price.
	Inches.	Inches.	Inches.	At Slow Speed.	£
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C 3	6	4	10	2,000	30
D 4	8	4	10	3,150	40
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F 6	8	6	10	7,200	50
G 7	10	6	12	7,200	60
H 8	8	8	10	14,000	65
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K 10	12	8	15	14,600	90
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NOTE.—*At quick speed these pumps will generally deliver double the quantity specified.*

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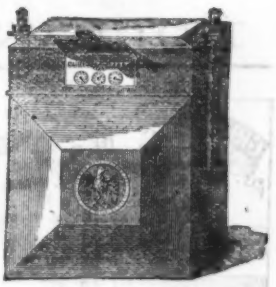

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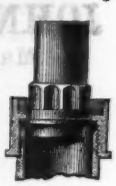

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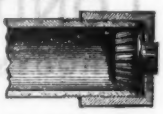

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The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended."
(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

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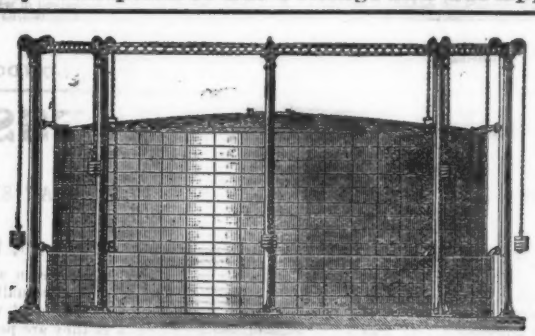

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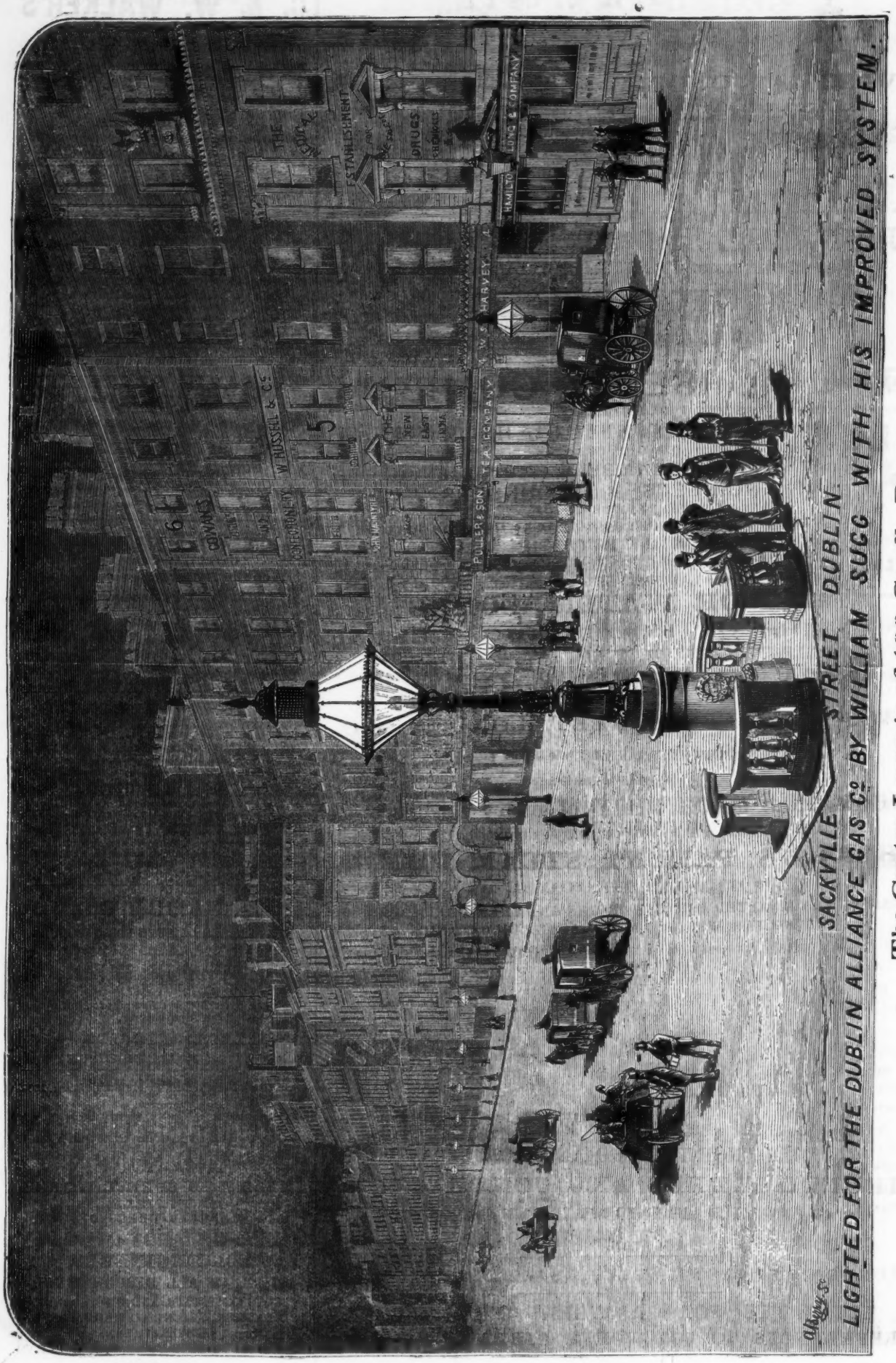
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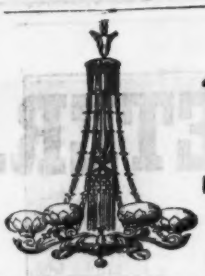

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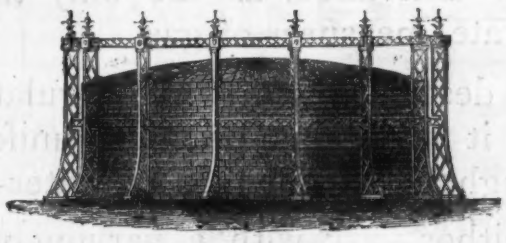

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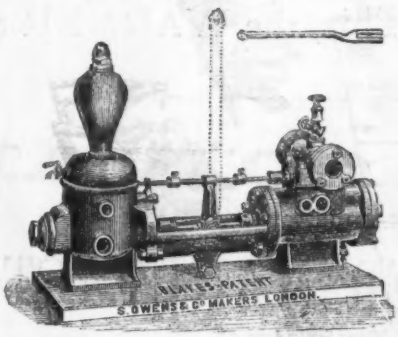

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

The Centre Lamp is of 400-Candle Power.

THE

"WARNER & COWAN" METER.

THIS Meter stands alone and unrivalled, as the only thoroughly reliable, and continuously accurate, measurer of gas.

The drum is properly described as "self-regulating," its construction being such that it maintains practical uniformity of discharge per revolution throughout all changes of water-line.

All other Wet Meters either vary with a varying water-line (because their drums are *not* self-regulating), or are complicated by "compensating" arrangements in the futile and *now wholly superfluous attempt* to make the water-line unvarying.

Loss of water by evaporation or otherwise, neglect to supply it at the proper time, or to the correct degree (so necessary for the registration of other Meters), produces no change in the measurement of the WARNER & COWAN. Even in the extreme case of a prolonged neglect to water leading to the extinction of the lights, nothing but inconvenience would arise; whereas with an ordinary Wet Meter this inconvenience would, in such a case, not only occur (and much sooner, because of the shorter range of float), but would be preceded by a considerable alteration of capacity, and therefore incorrect registration.

"Compensating" Meters, depending as they all do upon complex arrangements (extraneous to the drum), for maintaining the water-line, are not only inadequate to the duty, but unreliable in action.

The drum of a Meter being the measurer, ought to be *in itself* a true and unvarying measure. This, the WARNER & COWAN drum *alone* is.

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

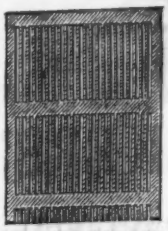
Sole Licensees and Manufacturers of

THE AUTOMATIC PRESSURE CHANGER,

[WM. COWAN'S PATENT.]

CHURCH ST., MILLBANK ST., *LONDON, S.W.* | DUTTON ST., NEW BRIDGE ST., *MANCHESTER.* | BUCCLEUCH ST. WORKS, *EDINBURGH.*

R. DEMPSTER AND SON'S



WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,

MADE BY SPECIAL MACHINERY.

SCRUBBERS FILLED WITH BOARDS,

On our approved principle, for the extraction of Ammonia.

Prices on application. References to First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, Near HALIFAX.

London Offices: 2, SUFFOLK LANE, CANNON STREET, E.C.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS

FOR

STREET LIGHTING, &c., WHICH REQUIRE NO GLASS CHIMNEY.

Speaking of these burners, erected on the Thames Embankment, the Governor of The Gaslight and Coke Company, at the half-yearly meeting, Aug. 15, 1879, says:

"Any gentleman who may wish to see the light, may do so at the foot of Westminster Bridge, where it is in direct contiguity with the electric light, so that he will be able to judge for himself. There is a light there that completely excels the electric light in the intensity of its illumination, and in the scope of its diffusion. The lamps on Westminster Bridge are some of Mr. Wigham's."

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., GAS ENGINEERS,

19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

J. & J. BRADDOCK,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY CONSUMERS GAS-METERS,

OF THE HIGHEST EXCELLENCE ONLY;

ROUND STATION-METERS,

ON CAST-IRON STANDS;

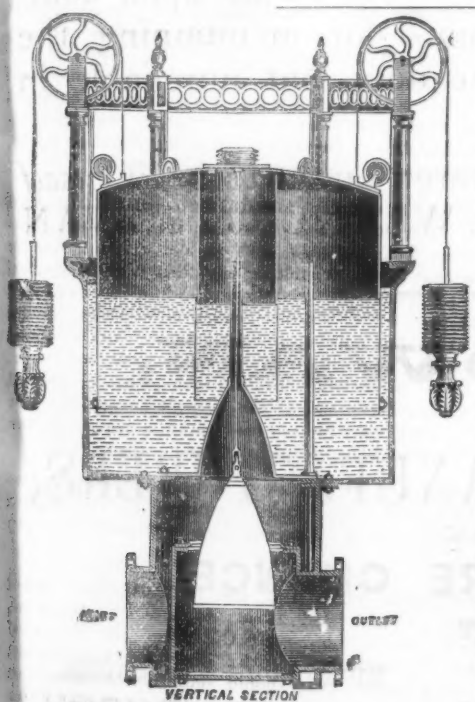
SQUARE STATION-METERS,

WITH PLANED JOINTS.

Messrs. Braddock beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash and when Cannel of the best description is scarce, it may well replace this material."

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

Sandell and Son having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

Established 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. Silver Medal, Paris, 1878.

TO MAKERS OF SULPHATE OF AMMONIA AND BUYERS OR SELLERS OF GAS LIQUOR.

F. SUTTON & CO., Norwich, are now prepared to Supply a Set of Apparatus with Standard Test Solutions for the rapid and accurate analysis of Gas Liquor, which can be used by any intelligent workman, so as to show the actual amount of Sulphate which can be got out of any sample of liquor in a few minutes, without any of the annoyance arising from saturation with acid, &c. Tables are also given, showing the quantity of acid of various strengths required for any given liquor, the accurate ounce-strength and percentage of pure ammonia, &c. Price of the set, with full direction and table (copyright), with materials sufficient for fifty analyses, £4 4s.

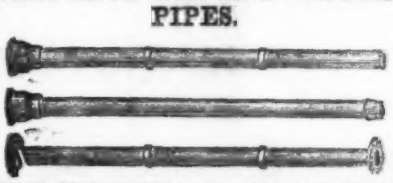
Post orders or cheques to be made payable to F. Sutton and Co., Manufacturing Chemists, Norwich, who also supply every description of Standard Solutions for Volumetric Analysis of Waters, Beers, Manures, &c., of guaranteed accuracy.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

THE

SILBER LIGHT COMPANY,

MANUFACTURERS OF

SILBER'S PATENT TUBULATED BURNERS

FOR

COAL OR AIR GAS,

And of SILBER'S BAT'S-WING GAS-BURNERS and every variety of Gas-Fittings.

ALSO MANUFACTURERS OF

EVERY DESCRIPTION OF LAMPS (burning Colza Oil, Petroleum, Paraffin, or Kerosene) FOR DOMESTIC PURPOSES, STREETS, RAILWAY STATIONS, SHIPS, &c., &c.

FIG. 1.
Silber's Patent Tubulated Gas-Burner, drawn full size.

FIG. 2.
Section of Silber's Tubulated Gas-Burner, the arrows indicating the currents of air to the flame —two externally and two internally.
Dr. Wallace, F.R.S.E., Gas Analyst of Glasgow, says of this burner: "It gives the steadiest flame of any Argand yet constructed."

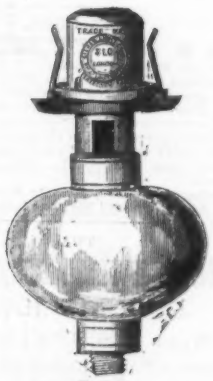


FIG. 3.
Silber's Tubulated Gas-Burner with glass bulb or vase beneath, and with larger inlet than aggregate outlet area, by which means the illuminating power for 5 cubic feet of 16-candle-light gas is increased one candle.

The Silber Tubulated Gas-Burner offers the following advantages over existing Argand Gas-Burners:—

1. It affords more light for 5 cubic feet of gas.
2. It is made of brass, and so put together that there is no liability of its melting, or coming to pieces in any other way, as burners made of soft metal are apt to do.
3. It is capable of burning from 4 to 7 cubic feet of gas per hour (by using chimneys of different lengths), and although the consumption be increased, **the illuminating power per cubic foot of gas remains almost quite constant.**
4. With the glass bulb or vase, as shown in fig. 3, the illuminating power for 5 cubic feet of 16-candle-light gas is **increased one candle.**

FIG. 4.
Silber's Bat's-Wing Gas-Burner.
The results obtained from this Burner are amongst the best obtained from any flat-flame Burners yet introduced.

FULL PARTICULARS & ENGRAVINGS

Forwarded on application to

THE SILBER LIGHT COMPANY,

49, WHITECROSS STREET,

LONDON, E.C.

FIG. 5.
Silber's Bat's-Wing Burner, with Opal Gas Moon.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

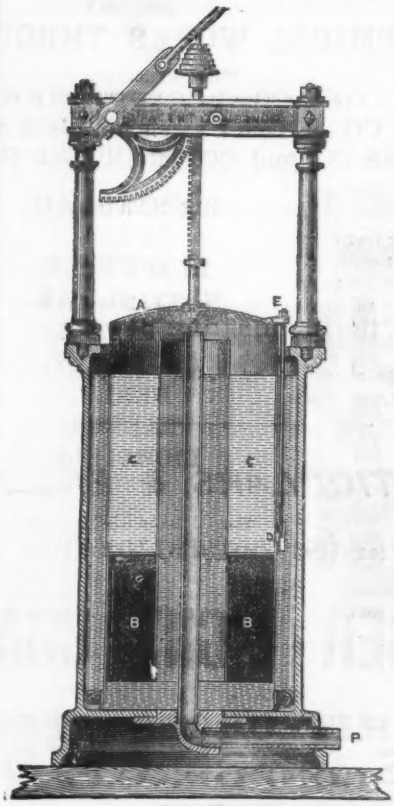
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 28.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

THE WIGAN COAL & IRON COMPANY,

LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

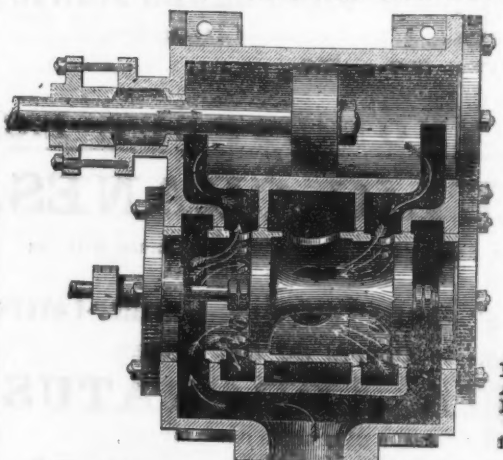
THE "RELIABLE" STEAM-PUMP

IS NOW IN USE AT NEARLY ALL THE

LEADING GAS AND CHEMICAL WORKS THROUGHOUT THE KINGDOM,

INCLUDING

THE GASLIGHT AND COKE CO., BECKTON NEW WORKS (24 supplied),
THE GASLIGHT AND COKE CO., GREAT CAMBRIDGE STREET WORKS, HACKNEY,
THE PHŒNIX GAS CO. and COMMERCIAL GAS CO., LONDON,



BIRMINGHAM, LEEDS, BLACKBURN, NOTTINGHAM, CARLISLE, COVENTRY, DERBY, EXETER, LICHFIELD,

BRISTOL, BRADFORD, WOLVERHAMPTON, JERSEY, TUNBRIDGE WELLS, RICHMOND, STRATFORD, DUDLEY,
and other Gas-Works.

The "RELIABLE" is undoubtedly, by means of its Piston Valve, the best Pump made for Gas-Works use. It is specially adapted for pumping TAR, OILS, AMMONIACAL LIQUOR, &c., and is the ONLY Pump that will do so SUCCESSFULLY and at the same time discharge double the quantity of liquid. The "RELIABLE" is the only Pump manufactured that is REVERSIBLE, and therefore is invaluable in frosty weather.

J. E. & SONS IMPROVED "RAM" STEAM-PUMPS, which are made with both Single and Double Rams and Steam Cylinders, are also admirably adapted for Gas-Works use.

For Price Lists and Testimonials, apply to the Sole Makers and Patentees,

JOSEPH EVANS & SONS, WOLVERHAMPTON,

MAKERS AND PATENTEES OF

PUMPS AND PUMPING MACHINERY FOR EVERY PURPOSE.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON.

ALEXANDER WRIGHT & CO.,

55, 55a, & 56, MILLBANK STREET, LONDON, S.W.,

MANUFACTURERS OF

WET & DRY GAS-METERS & GAS APPARATUS,

AND SOLE MAKERS OF

WRIGHT'S REGISTERING PRESSURE GAUGE,

Which has for years been so extensively employed by Gas Companies and others, at home and abroad, have learned that inferior and imperfect dial papers bearing their name, for use with the above instruments, have been and are being produced for and sold by one or more other firms. The genuine dial papers are printed from plates accurately engraved by machinery, so that the scales are correct, which cannot be the case with the spurious papers mentioned above.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE:

6, LITTLE BUSH LANE, CANNON STREET, E.C.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at Beckton, Hull, and other Gas-Works.

HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers.

Sixteen recently erected at Beckton, applied to Covers 30 feet square.

SULPHATE OF AMMONIA APPARATUS,

IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY,
AND IN COURSE OF ERECTION AT THE CARLISLE CORPORATION GAS-WORKS.

Special "REGULUS COCKS" manufactured to stand Acid.

FOR PARTICULARS, APPLY TO

JOHN ABBOT & CO., LIMITED,

2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE.

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